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PROJECT SPECIFIC PLAN FOR PREDESIGN SAMPLING IN THE AREA 2, PHASE II - PARTS TWO AND THREE

SOIL AND DISPOSAL FACILITY PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

OCTOBER 1999

U.S. DEPARTMENT OF ENERGY
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LIST OF ACRONYMS AND ABBREVIATIONS

A2PII	Area 2, Phase II
A2PIII	Area 2, Phase III
APM	Area Project Manager
ASL	analytical support level
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
DQO	Data Quality Objectives
ECDC	Engineering/Construction Document Control
EPA	U.S. Environmental Protection Agency
FDF	Fluor Daniel Fernald
FEMP	Fernald Environmental Management Project
FRL	final remediation level
GPS	global positioning system
HPGe	high-purity germanium detector
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
ICP/MS	Inductively Coupled Plasma/Mass Spectrometry
LAN	Local Area Network
MDC	minimum detection concentration
NaI	Sodium Iodide
OSDF	On-Site Disposal Facility
OU5	Operable Unit 5
pCi/g	picoCuries per gram
ppm	parts per million
PSP	Project Specific Plan
QA	Quality Assurance
RI/FS	Remedial Investigation/Feasibility Study
RMS	Radiation Measurement System
RSS	Radiation Scanning System
RTIMP	Real-Time Instrumentation Measurement Program
RTRAK	Real-Time Radiation Tracking System
SDFP	Soil and Disposal Facility Project
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SP-3	Soil Stockpile 3
SP-7	Soil Stockpile 7
SWUs	Southern Waste Units
TALs	Target Analyte Lists
V/FCN	Variance/Field Change Notice
WAC	Waste Acceptance Criteria
WAO	Waste Acceptance Organization

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this project specific plan (PSP) is to provide details of the predesign sampling and real-time data collection activities to be conducted in Area 2, Phase II (A2PII) Parts Two and Three in the southwest portion of the Fernald Environmental Management Project (FEMP). A2PII Part Two is bounded by the Southern Waste Units (SWUs) to the south, Paddys Run to the west, the Pilot Plant drainage ditch and silos area to the north, the south construction access road and Building 45 access road to the east and is divided by the On-Site Disposal Facility (OSDF) Haul Road. A2PII Part Three contains Soil Stockpile 3 (SP-3) and a small area east of the pile and west of the storm sewer outfall ditch (see Figure 1-1). This area also includes the remainder of A2PII that was not included in the predesign sampling in Area 2, Phase I Non-Waste Units and Area 2, Phase II-Part One (20400-PSP-0002). Soil Pile MTL-HRD-011 was included in the A2PIII Part One certification PSP. The OSDF Haul Road, SP-3, Pilot Plant drainage ditch, South Field Construction Haul Road, and the SWU construction support area (see Figure 1-2) will be addressed in separate PSPs. Approximately 50 acres are under investigation. Sampling/real-time data collection activities of A2PII Parts Two and Three are necessary to help determine if remediation is needed. Excavation in these areas will be required if either of the following conditions exist:

- sampling/real-time results indicate soil or soil like material has contamination levels exceeding final remediation levels (FRLs)
- visual examination of the soil sample cores indicate that flyash, impacted material, or non-native debris within the soil is present.

The data collected will also be used to determine the appropriate disposition and extent of the material if remediation is necessary.

1.2 BACKGROUND

A2PII Part Two and Three include Operable Unit 5 (OU5) soils located in the southwestern portion of the FEMP and currently consist of open, grass-covered fields and pine wood lots. The surface features and area topography are depicted in Figure 1-3. Previous soil sampling/analysis projects for these areas include the Characterization Investigation Study conducted by the Roy F. Weston Company and the OU5 Remedial Investigation/Feasibility Study (RI/FS). In addition, cultural resource surveys have been conducted which involved lithological data collection. Review of aerial photos, in addition to research of previous investigations, indicate that some disturbances have occurred in portions of A2PII Parts Two and Three. Although there were no known disposal activities associated in this area as documented in the OU5 RI/FS, subsequent construction activities along the Haul Road have uncovered process material.

The disturbances, which are briefly referenced in the PSP, are evident in the aerial photos included in a September 1988 Site Analysis Interim Report (TS-PIC-88088) that were conducted for the U.S. Environmental Protection Agency's (EPA) Environmental Monitoring Systems Laboratory Office of Research and Development.

Earth movement near the current location of soil pile MTL-HRD-011 and SWU equipment wash facility is evident in the 1954 photo. An investigative trench was created and soil sampling conducted in this area as part of the OU5 RI/FS and no evidence of contamination was found. In addition, certification sampling of the MTL-HRD-011 pile footprint was recently conducted as part of Area 2, Phase III (A2PIII) Part One. Results from this sampling event indicate no above-FRL contamination for primary radionuclides. Based on the results from these two previous efforts, no additional predesign investigative sampling is planned in this area.

Dirt roads/paths dissecting the east field around the current meteorological tower location are especially evident in the early 1950 photos. Review of the topographical differences east of the Haul Road suggest that no fill was added in this area and, as a result, no sample locations are identified to investigate these disturbances. However, real-time surface scanning is planned to cover this footprint.

The aerial photos also indicate roads/paths and disturbances west of the current Haul Road near the former gravel pad. Several samples are planned for these suspect fill locations within this disturbance area. Also, real-time scanning along the existing road and cleared portions around the former gravel pad is planned.

Data queries were conducted from the Sitewide Environmental Database (SED) to identify sample locations of above-FRL concentrations within A2PIII Parts Two and Three and in adjacent areas to the north in the Pilot Plant Drainage Ditch and along Paddys Run. Sample results with non-detects greater than FRL (i.e., sample 121035 for n-nitro-di-n-propylamine) were not considered for further investigation due to the inconclusiveness of the data and the knowledge of previous disposal activities. In addition, non-validated data (i.e., 31567 for total uranium) were not considered for further investigation. The location of validated, detected above-FRL samples are plotted in Figure 1-4, along with results, depth, and data qualifier.

Sample 007084 has above-FRL total uranium concentrations at the depth of 38 feet. Three samples (121098, 20029, and 20030) have arsenic results above FRL concentrations. The depth of contamination for 121098 and 20029 is at the surface and 20030 is at 2 feet. One sample (118789) has surface level beryllium results above-FRL concentrations. Additional investigation of these sample locations will be conducted under this PSP.

Previous investigations indicated no other areas with above-FRL constituents of concern (COCs), including technetium-99. The primary radionuclides will be target analytes in all samples in addition to the samples requiring arsenic and beryllium analysis. Radiation Measurement System (RMS) and high-purity germanium detector (HPGe) data will be collected for total uranium, radium-226, thorium-232, and gross activity.

1.3 SCOPE

This PSP covers all data collection activities associated with predesign in A2PII Parts Two and Three. This PSP supplements previous investigations and does not cover any certification sampling. Thirty-seven boring locations have initially been selected within this investigation area for radiological field frisking, lithological determination, and potential submittal for radiological analysis. As much of the investigation area as possible will be scanned with real-time *in situ* RMS and HPGe detectors. Portions of the suspect fill areas will also be scanned with the magnetometer.

All data collection activities will be consistent with the Sitewide CERCLA Quality Assurance Plan (SCQ) and Section 3.1 of the Sitewide Excavation Plan (SEP). Physical samples will be collected in accordance with Data Quality Objectives (DQO) SL-048, Rev. 5 (Appendix A). Real-time data collection activities will be in accordance with DQO SL-056 (Appendix A). The data will be utilized to assess whether COC concentrations in these areas are lower than the FRLs outlined in the OU5 Record of Decision. The data collected under this plan will also be utilized to determine whether soil and soil-like material from the area meet the OSDF waste acceptance criteria (WAC), as defined in the SEP, the OSDF WAC Attainment Plan, and the Impacted Materials Placement Plan. All sampling activities and characterization data collection activities will conform to the requirements of the documents listed in Section 7.0.

1.4 KEY PERSONNEL

Personnel responsible for conducting work in accordance with this PSP are listed in Table 1-1.

TABLE 1-1
KEY PERSONNEL

Title	Primary	Alternate
DOE Contact	Robert Janke	Kathi Nickel
Area 2 Project Manager	Tom Crawford	Jyh-Dong Chiou
Area 2 Characterization Lead	Mike Rolfes	Darren Wessel
Real-Time Instrumentation Measurement Program (RTIMP) Manager	Joan White	Dale Seiller
RTIMP Field Lead	Brian McDaniel	Dave Allen
Field Sampling Lead	Mike Frank	Tom Buhrlage
Surveying Lead	Jim Schwing	Jim Capannari
Data Management Lead	Deanna Diallo	Jeff Maple
Data Validation Contact	Jim Chambers	Jim Cross
Laboratory Contact	Audrey Hannum	Denise Arico
Safety and Health Contact	Lewis Wiedeman	Debra Grant
Radiological Control Contact	Corey Fabricante	Dan Stempfley
Quality Assurance Contact	Reinhard Friske	Ervin O'Bryan
Waste Acceptance Organization (WAO) Contact	Linda Barlow	To Be Determined

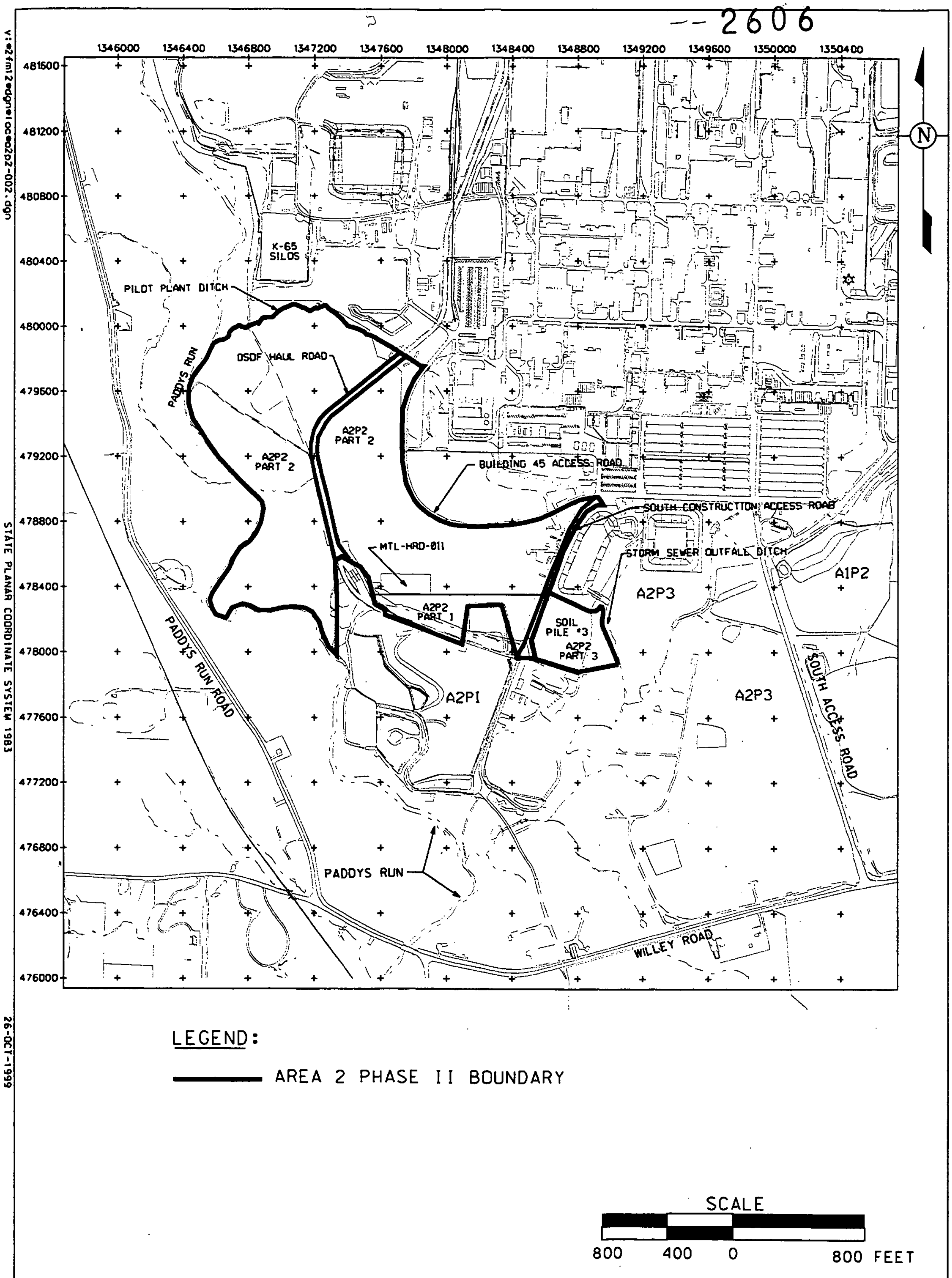

FIGURE 1-1. A2PII LOCATION MAP

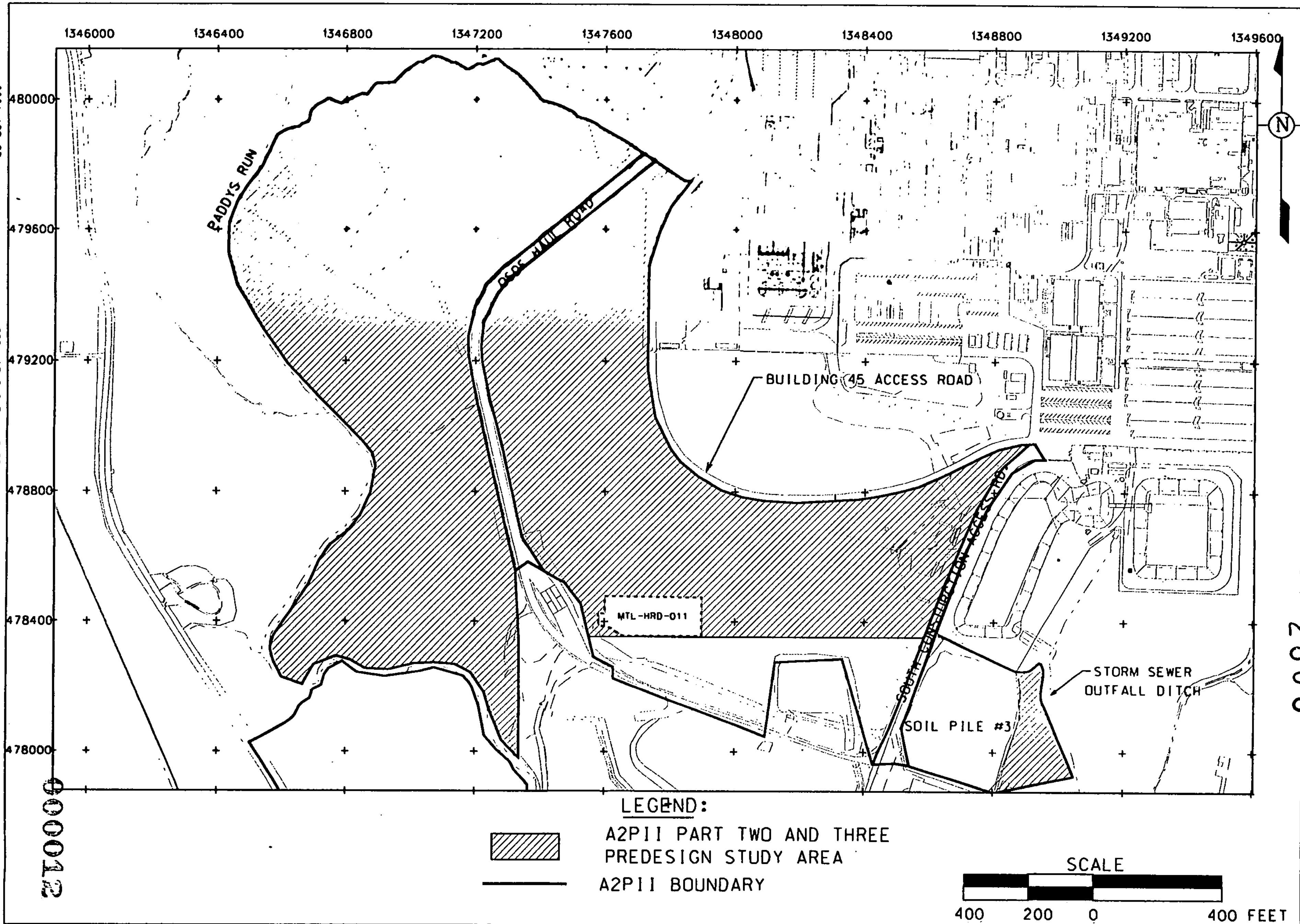

FIGURE 1-2. A2PII PART TWO AND THREE PREDESIGN INVESTIGATION ZONE

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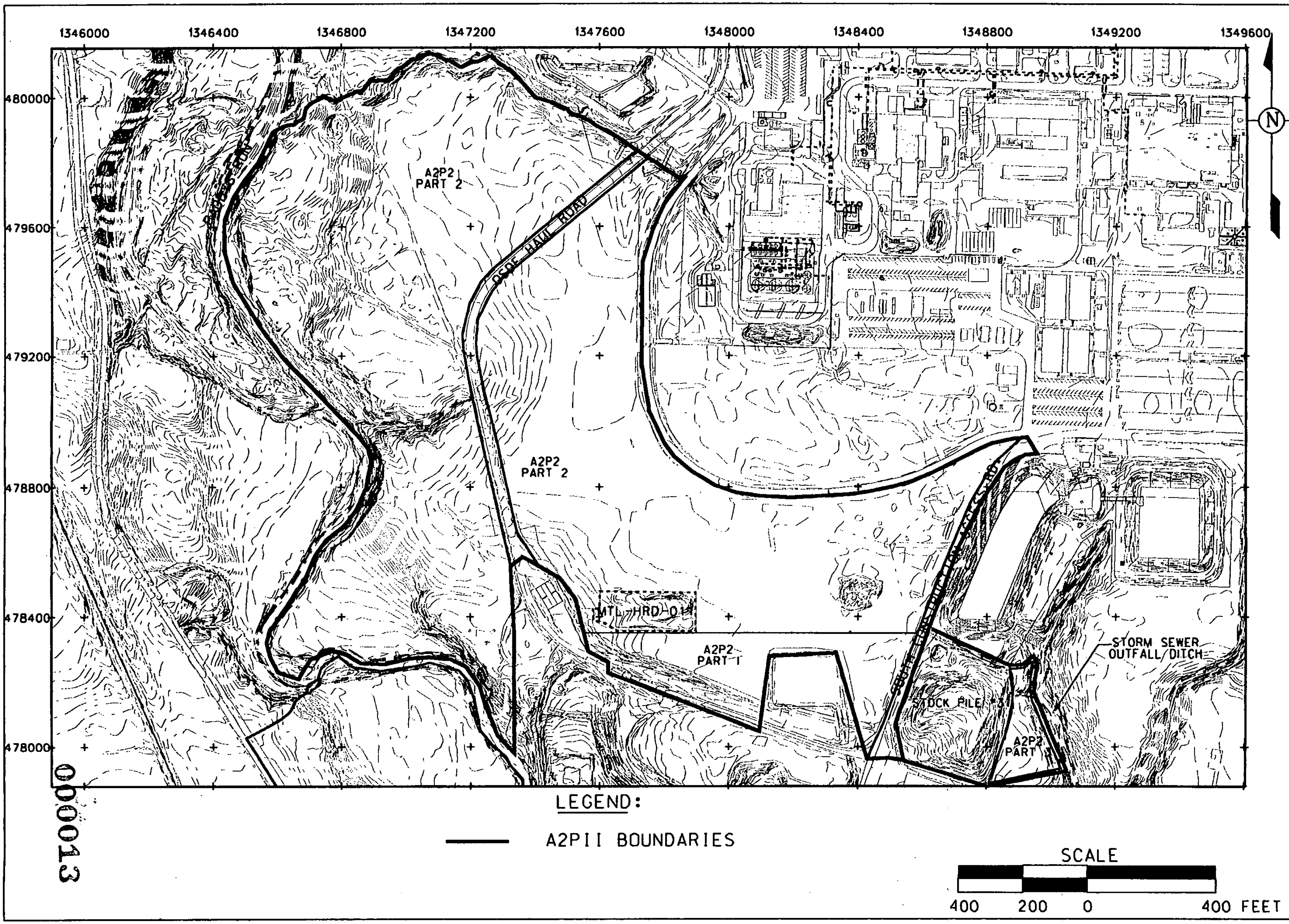

FIGURE 1-3. A2PII PART TWO AND THREE TOPOGRAPHY/SURFACE FEATURES

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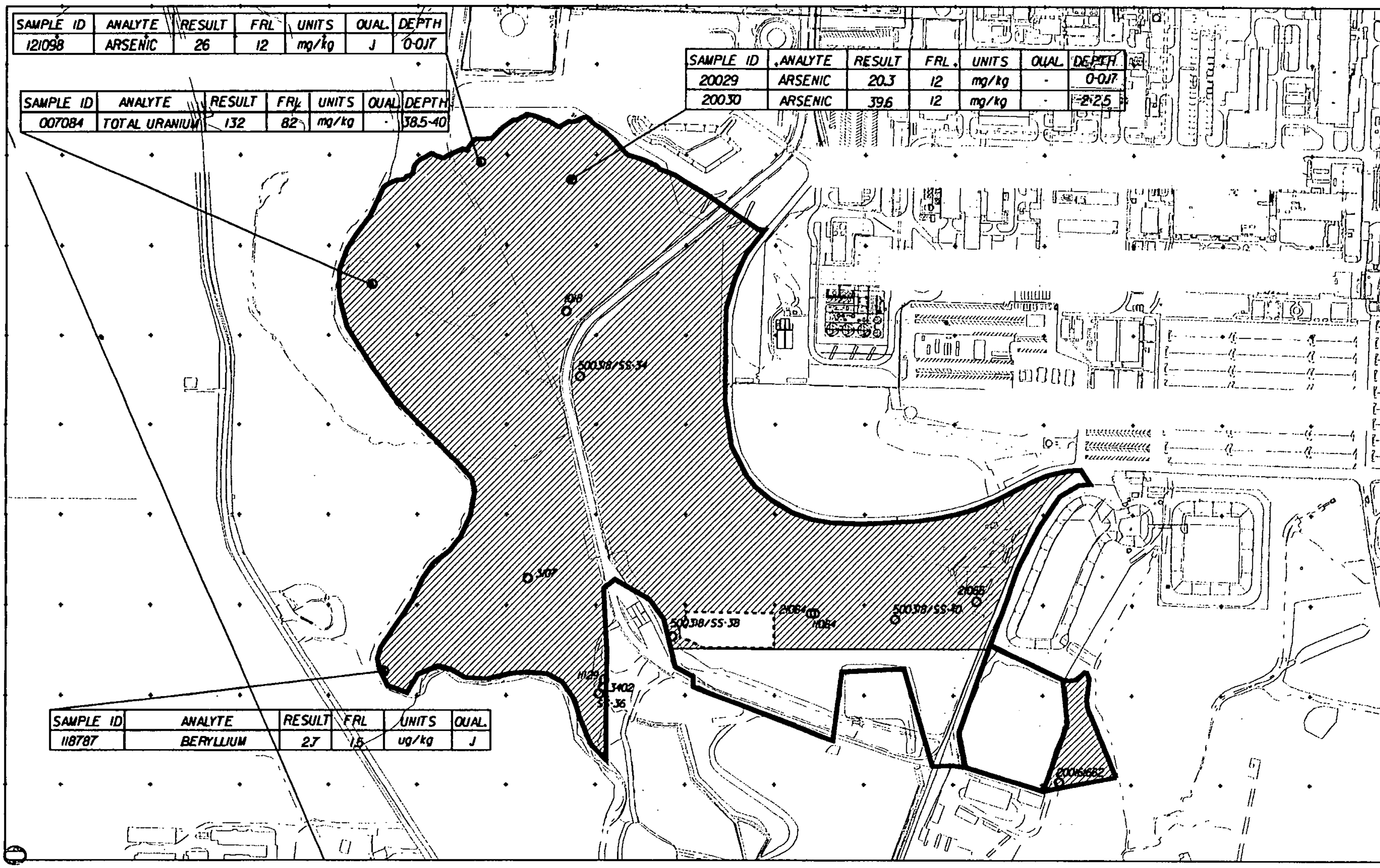

SAMPLE ID	ANALYTE	RESULT	FRL	UNITS	QUAL.	DEPTH
121098	ARSENIC	26	12	mg/kg	J	0-0.17

SAMPLE ID	ANALYTE	RESULT	FRL	UNITS	QUAL	DEPTH
007084	TOTAL URANIUM	132	82	mg/kg	-	38.5-40

SAMPLE ID	ANALYTE	RESULT	FRL	UNITS	QUAL.	DEPTH
20029	ARSENIC	20.3	12	mg/kg	-	0-0.17
20030	ARSENIC	39.6	12	mg/kg	-	2-2.5

SAMPLE ID	ANALYTE	RESULT	FRL	UNITS	QUAL.
118787	BERYLLIUM	2.7	1.5	ug/kg	J

LEGEND:

A2PII BOUNDARY
• ABOVE FRL LOCATIONS
o BELOW FRL LOCATIONS

J = ESTIMATED RESULTS
(-) = NO DATA QUALIFIER

SCALE

500 250 0 500 FEET

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v:a2fm12adgnaloc#a2p2-004.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 1-4. HISTORIC SAMPLE LOCATIONS

25-OCT-1999

2.0 FIELD ACTIVITY

2.1 SURVEYING SAMPLE POINTS

The sampling locations will be marked by the Fluor Daniel Fernald (FDF) Surveying and Mapping group. Northing (Y) and easting (X) coordinate values (NAD83, Ohio South Zone, #3402) will be determined using standard survey practices and standard positioning instrumentation [electronic total stations and Global Positioning System (GPS) receivers]. Field locations will be marked in a manner easily identifiable by all field personnel using survey stakes or flags. Survey information (coordinate data) will be downloaded at the completion of each survey job or at the end of each day and transferred electronically to the Survey Lead. This information will be forwarded to the Characterization Lead or Data Management Lead and/or designees.

Magnetic surveying will also be conducted by the FDF Surveying and Mapping group in the suspect fill areas denoted in Figure 2-1. This surveying will consist of scanning the surface of the soil and exposed debris with a magnetometer to assist in detection of ferrous type material (metal drums, rebar, etc.). An increase in the audio alarm system of the magnetometer indicates the presence of ferrous containing material. Depending on the size of the buried object, the magnetometer can detect to depths of 10 feet and below. The boundaries of areas with elevated magnetometer readings will be marked in the field in a manner easily identifiable by all field personnel using stakes or flags. Survey coordinates will be collected to delineate the area for potential further investigation such as trenching or ground penetrating radar. Any additional field investigation will be documented with a Variance/Field Change Notice (V/FCN).

2.2 PHYSICAL SAMPLE COLLECTION

Thirty-eight boring locations will be sampled in A2PII Part Two and two in A2PII Part Three. The boring locations are shown in Figure 2-1 and listed with identification numbers in Table 2-1 (note: boring locations with an appendix of A, B, C, or D will not be denoted with a separate identification point). Boring locations were designed to determine the extent of impacted above-FRL material, if any, in the investigation zone. Twenty of the locations were chosen to investigate anticipated fill material based on historical topographical differences. One location was chosen due to potential impact from a current subcontractor trailer area. The other locations were chosen to further investigate previous samples with above-FRL concentrations.

The depth for each boring (Table 2-1) was estimated by overlaying a 1952 topographical map with a current topographical map and calculating the differences in elevations for all identified borings. Any area shown to have a topographical difference greater than 2 feet, when compared to historical topographical data of pre-site activities, was selected to be sampled.

Four borings were placed to further investigate the above-FRL arsenic, beryllium, and uranium results that were discovered during previous investigations. One will be placed at the location of the above FRL result and four borings, designated as A, B, C, and D, will be taken approximately 5 feet to the north, south, east and west from the location to bound the potential contamination. The historical sample identification as it relates to the boring location on Figure 2-1 is listed below:

Boring Location	RI/FS Sample Identification	Constitute of Concern
A2P2-PT2-1	20029/20030	Arsenic
A2P2-PT2-2	121098	Arsenic
A2P2-PT2-3	118789	Beryllium
A2P2-PT2-4	007084	Uranium

Additional boring and sample locations may be identified by the Characterization Lead or designee based on results of real-time field measurements and analytical data. Any additional borings will be advanced to 3.5 feet below identified contamination. All field modifications and/or additional samples will be documented in a V/FCN. Samples will be submitted to the FEMP on-site laboratory for analysis of the target analyte lists (TALs) identified in Appendix B.

2.2.1 Sample Collection and Screening Methods

Samples will primarily be collected using the Geoprobe® Model 5400 and a Macro-core® sampler in accordance with procedure EQT-06, Geoprobe® Model 5400-Operation and Maintenance. The sampling technicians will remove all existing surface vegetation within an approximate 6-inch radius of the sample point using a stainless steel trowel or clean nitrile gloves, taking care to minimize the removal of any soil. If required, the Geoprobe® drill bit will be used to drill through any subsurface obstacles. At the Field Sampling Lead's discretion, other sampling tools may be utilized (e.g., Geoprobe® dual tube sampler) in accordance with environmental monitoring procedures. If Geoprobe® accessibility is not possible, the technicians will retrieve the samples using a hand auger or manual Macro-core® sampler according to procedure SMPL-01, Solids Sampling. If the boring or sample location needs to be relocated to an area more than 3 feet from the original location due to inaccessibility, a V/FCN will be generated and approved. If refusal or resistance is encountered during soil borings, up to two additional borings within a 3-foot radius of the original point may be attempted in order to collect the specified samples. All encounters with subsurface debris will be noted in the field log.

Each boring should be advanced to the estimated depth specified in Table 2-1 or until the lithology indicates the boring has reached native soil (whichever is deeper); this determination will be made by the geologist. The cores will be laid on clean plastic, divided into 12-inch depth increments, labeled and scanned with a beta-gamma field frisker. Sample intervals exhibiting greater than background counts for beta-gamma activity will be containerized, including the intervals above and below to potentially bound the contamination. The sample interval with the highest beta-gamma activity at depth for each core will be submitted for analysis along with the intervals above and below. The remaining sample intervals exhibiting greater than background counts for beta-gamma activity from each core will be archived. If no sample intervals in a core exhibit greater than background counts for beta-gamma activity, then the first 12-inch interval (surface soil) will be submitted for analysis. Intervals not submitted for analysis or archived can be discarded after the field frisking and visual classification is complete except for sample locations shown below and their respective bounding boring intervals. The following intervals will be submitted for analysis regardless of the field frisker information based on previous investigation data:

Sample Identification	Depth (in Feet)	Archive Depth (in Feet)
A2P2-PT2-1	0-1	2-3
A2P2-PT2-1	2-3	1-2 and 3-4
A2P2-PT2-2	0-1	2-3
A2P2-PT2-3	0-1	2-3
A2P2-PT2-4	38-39	37-38
A2P2-PT2-4	39-40	40-41

The bounding intervals for these samples (either below or above and below the depth) will be archived.

The visual classification of the soil material (determined by a geologist), along with the frisker readings, will be recorded on the Visual Classification of Soils Log. Gross fragments of construction rubble (e.g. bolts, nails, concrete, wood, metal) will be removed prior to performing the beta-gamma scan and placing each soil interval into a sample container. A description of the removed construction rubble will be recorded in the Visual Classification of Soils Log. Gross fragments will be dispositioned with WAO concurrence in accordance with Section 2.2.4.

All field measurements and sample collection information shall be recorded on the Sample Collection Log, the Field Activity Log, and the Chain of Custody/Request for Analysis, as required. All samples will be assigned a unique sample number (see Table 2-1) which shall appear on the Chain of Custody/Request for Analysis and used to identify the sample during analysis, data entry, and data management.

Adherence to EP-0003, *Unexpected Discovery of Cultural Resources*, is required during all sampling activities. In the event of an unexpected discovery of a culture resource, the procedure directs personnel in the proper response to the finding.

2.2.2 Sampling Equipment Decontamination

Sampling equipment that comes in contact with the soil sample intervals will be decontaminated by Level II methods prior to transport to the field location, at each cutting shoe change (in the case of the Macro-core® sampler) and after sampling under this PSP is completed. If hand augers are used, a Level II decontaminated auger should be used after a zone of contamination or suspected contamination and prior to collection of a sample interval to be analyzed or archived for each 1-foot soil interval. Probe rods and other equipment that do not contact the soil collected interval do not require decontamination between sample boring locations. The decontaminated equipment can be dried with clean disposable wipes or air dried.

2.2.3 Borehole Abandonment

Each borehole will be plugged using bentonite pellets immediately after sample collection is completed. Borehole collapse, expected to be minimal in the sampling area, does not pose a significant risk of contaminating deeper zones due to the immediate placement of pellets into the borehole following soil core collection. The geologist may direct the field team to plug a boring with a bentonite slurry if the borehole sidewalls are unstable and immediate cave-in is possible. Any surface gravel or rock will be replaced with the equal thickness of a similar material. A Borehole Abandonment Log will be completed for each boring location.

2.2.4 Disposition of Wastes

During completion of physical sampling activities, field personnel may generate small amounts of soil, sediment, water, contact waste, or construction rubble that was segregated from soil samples (e.g. bolts, nails, concrete, metal). Management of these waste streams will be coordinated with WAO. WAO will evaluate the sample material (including soil archive samples) and determine the disposition based on analytical data, material type, and location. If sample material is below-WAC, the material may be placed near the sample location. Any Category 2 material may be placed in an existing Category 2 pile for OSDF placement. Above-WAC sample material will be placed in SP-7 (or other designated above-WAC location). Archive soil samples will be disposed of within 30 days following regulatory agency approval of the remedial action plan for the A2PII Part Two and Three soil. The location for disposition of these soils will be determined by the WAO Lead or designee.

Generation of decontamination waters will be minimized in the field. This water will be disposed of in a storm water collection basin that discharges to the Advanced Wastewater Treatment Facility after approval of the FEMP Wastewater Discharge Request. Contact waste generation will be minimized by limiting contact with sample media and by only using disposable materials which are necessary.

2.3 REAL-TIME MEASUREMENTS

Investigation with real-time scanning equipment encompasses all of A2PII Part Two and Three except the footprints of the OSDF Haul Road and SWU Construction Road and the area within the fences surrounding MTL-HRD-011 and Stockpile Three. Real-time equipment will be used to scan as close to 100 percent of the area as possible without jeopardizing safety (especially near the high, steep streambanks of Paddys Run and along the roads during high traffic). The investigation area is divided into three classifications for real-time monitoring (Figure 2-2): *RMS Accessible*, *RMS Accessible without the GPS*, and *RMS Inaccessible/HPGe Accessible*.

RMS Accessible areas are expected to be achievable with RMS detectors and the on-board global GPS. *RMS Accessible without the GPS* areas are expected to be achievable, but the on-board GPS may be subject to satellite signal interference from the overhead tree canopy, thus preventing locations from being tied to the measurements. For these areas, the locations can be determined by establishing baseline distances along the paths, then using the count time and detector speed and/or the time it takes to travel the set distance to calculate the location of each reading.

RMS Inaccessible/HPGe Accessible areas have heavy vegetation which will inhibit use of the RMS. Extensive clearing and removal of small trees, ground cover, and other vegetation will be needed prior to scanning. Investigation of these inaccessible areas will most likely be conducted with the HPGe equipment unless the cleared area is adequate for *RMS without GPS* scanning. In a few places, steep slopes and rough terrain will inhibit coverage with all real-time equipment.

Real-time data will be used to assess the extent of above-FRL concentrations and the need for additional physical sample locations not denoted in Table 2-1. Real-time RMS and HPGe surface measurements will be collected at Analytical Support Level (ASL) A and will require no data validation (refer to the SCQ for a definition of ASLs).

2.3.1 *In Situ* Gamma Spectroscopy Equipment Determination

The accessible areas will be characterized using *in situ* gamma spectrometry equipment [RMS systems which utilize a Sodium Iodide (NaI) detector system, and/or the HPGe], consistent with DQO SL-056 and the User's Manual. The real-time radiation tracking system (RTRAK) is utilized for larger flat areas that are readily accessible. The radiation scanning system (RSS) is utilized for small areas, gradual slopes or areas not accessible by the RTRAK. The HPGe is utilized for areas that are inaccessible to both the RTRAK or RSS and for confirmation and delineation measurements. A walk-down of the area by Characterization and/or RTIMP representatives may be required to determine the appropriate type of *in situ* gamma spectroscopy equipment needed. The decision to use any of these evaluation techniques will be made by the Characterization Lead and RTIMP Field Lead or their designees.

2.3.2 RMS Data Acquisition

The RMS coverage will be used to conduct a surface scan (Phase I) covering as close to 100 percent coverage as possible of the accessible area. The spectral acquisition time will be 4 seconds with data collected at a detector speed of 1 mile per hour as determined by the on-board GPS. The RTRAK or RSS passes will typically be in a back and forth pattern after two perimeter passes have been completed. Alternatively, a circular pattern may be more appropriate. The RTRAK overlapping passes are achieved by placing the innermost tire track in the former outermost tire track from the previous passes, achieving an approximate 0.4 meter scanning overlap. Stakes or other markers may be used to keep the RSS on track. The RTRAK or RSS measurements will be accompanied by GPS northing and easting coordinates. GPS operations are described in Section 5.8 of the User's Manual. The RTRAK or RSS will use a 2-point running average (2 spectra average) to determine the trigger level of 1x the FRL for the following COCs: total uranium [1x FRL = 82 parts per million (ppm)], thorium-232 [1x FRL = 1.5 picocuries per gram (pCi/g)], radium-226 (1x FRL = 1.7 pCi/g). If RTRAK or RSS scans indicate measurement results greater than 1x FRL for total uranium, thorium-232, or radium-226, the location of the above-trigger level measurements will be further investigated with HPGe measurements or physical sampling. Further investigation with HPGe measurements may involve confirmation and delineation as described in Section 2.3.4.

2.3.3 HPGe Data Acquisition

If the HPGe detectors are used to conduct a surface scan (Phase I), the data acquisition parameters will be a detector height of 1 meter and a spectral acquisition time of 15 minutes. If more than one HPGe measurement is required, the center of the measurements should be located nominally 11 meters (approximately 36 feet) apart to achieve the 99.1 percent coverage. The HPGe trigger level for characterization with 1 meter detector heights is 1x the FRL for the following COCs: total uranium (1x FRL = 82 ppm), thorium-232 (1x FRL = 1.5 pCi/g), radium-226 (1x FRL = 1.7 pCi/g). If the HPGe scans indicate measurement results greater than 1x FRL for total uranium, thorium-232 or radium-226, then the location may be further investigated with additional HPGe measurements and/or physical sampling. Further investigation with HPGe measurements may involve confirmation and delineation as described in Section 2.3.4. This determination will be at the discretion of the Characterization Lead or designee.

HPGe measurements will be accompanied by GPS northing and easting coordinates. One duplicate HPGe measurement will be collected for every 20 HPGe measurements performed. The duplicate will be collected immediately after the initial measurement at the same acquisition time and detector height.

2.3.4 Confirmation and Delineation

Confirmation (Phase II) can be performed with HPGe detectors to confirm any areas above 1xFRL with RMS for the appropriate COC and 1xFRL for HPGe (at 1 meter). A HPGe scan will be collected at both 1 meter and 31 centimeters (cm) for a RMS confirmation. Either measurement over 2xFRL at 1 meter or 31 cm will be considered a confirmation. A HPGe scan will be collected at both 31 cm and 15 cm for a HPGe confirmation.

Delineation can be performed to determine the horizontal migration of contamination for the COC at 15 cm height and an acquistion time of 15 minutes. The area will be considered a "hot spot" if data is 3x FRL for the COC. This area will the be grided in a triangular grid with a two meter distance between each detector location.

2.3.5 Surface Moisture Measurements

Surface moisture measurements are used to correct *in situ* RTIMP equipment gamma spectroscopy measurement data in order to report data on a dry weight basis prior to mapping. Surface moisture measurements will be collected with an *in situ* moisture measurement instrument (i.e., Troxler® moisture gauge or Zeltex® Infrared Moisture Meter) within 8 hours of the collection of gamma spectroscopy measurement data. Moisture measurements may be taken more frequently if ambient weather or soil moisture conditions change or are expected to change, including watering for dust control. Field conditions, such as weather, will be noted on the applicable electronic field worksheet.

At least one surface moisture measurement will be collected for each area that is approximately 0.5 acre (100 feet by 200 feet) in size or smaller. More than one moisture measurement can be collected for each area if the surface moisture appears visibly different over the area. If a large difference in measurements is noted by the RTIMP Lead or designee, the data will be re-evaluated. One surface moisture measurement will be collected at each HPGe measurement location.

If conditions prevent the use of a field moisture instrument, a default moisture value of 20 percent (which will overcorrect data in dry conditions and undercorrect in wet conditions) may be used. Field moisture measurements and moisture-corrected data are discussed in detail in Sections 3.8 and 5.2 of the RTRAK User's Manual.

2.4 BACKGROUND RADON MONITORING

Background radon monitoring will be utilized during the collection of real-time measurements to obtain background radon information from the time data collection begins until after the final measurement is completed. The monitor will be placed in one location for the day where it will be set at the same height as the detector being used to collect the soil radiation measurements (RMS detector height = 31 cm). The background radon data will be used to correct the radium-226 data per Section 5.3 of the RTRAK User's Manual.

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2.5 REAL-TIME DATA MAPPING

As the RTIMP measurements are acquired, the data will be electronically loaded into mapping software through manual file transfer or Ethernet. A set of maps and/or data summaries will be given to the Characterization Lead or designee. Maps will be generated indicating radionuclide concentrations at geographic locations (northing and easting). The maps will depict the following:

- COC concentration maps - depicts total uranium, radium-226, thorium-232 concentrations (2 point running average) at 0.5x FRL, 1x FRL, 2x FRL, and 3x FRL . The total uranium concentration maps will also depict above-WAC concentrations (721 ppm for RTRAK/RSS and 928 ppm for HPGe), if present.

- HPGe location map - shows field of view circles that are color coded for COC concentrations and denotes identification number for each HPGe measurement, including a data summary printout for each HPGe measurement.

2.6 TRACKING/MANAGING DATA COLLECTION

2.6.1 Physical Samples and Real-Time Measurements

All physical samples and real-time measurements will be assigned a unique alpha-numeric identification for data tracking purposes and will contain one or more of the following designators:

1. Area Designator: Denotes physical sampling area or real-time measurement area:
   A2P2-PT2 = Area 2, Phase II Part Two
   A2P2-PT3 = Area 2, Phase II Part Three

   Note: A numerical "2" is used in place of the roman numerals "II" for data management purposes

2. Location Designator: Location designates the sequential number of physical samples. The first sample taken is 1 and any subsequent samples are numbered sequentially (2, 3, 4, etc.). An alpha character (A, B, C, or D) is also included for the bounding samples.

   OR

   Batch number designates the sequential numbering of batch runs that are unique to each of the RMS systems

   OR

   Location designates the sequential number of HPGe measurements. The first measurement taken is 1 and any subsequent measurements are numbered sequentially (2, 3, 4, etc.).

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3. Depth Interval
   (if applicable): Denotes depth interval in 12-inch increments, 1 (0 to 1 feet), 2 (1 to 2 feet), etc.

4. Measurement designator: G = HPGe gamma measurement and associated moisture measurement
   R = Radiological analyses
   V = Archived sample
   M = Metals analyses

5. Quality control designators
   (if necessary): D = duplicate measurement

Using these guidelines, the unique identification scheme for each measurement technique is as follows:

RMS Measurement Identification: use No. 1 and 2 designator above

Example: A2P2-PT2-684 where: A2P2-PT2 = Area 2, Phase II Part Two
684 = RTRAK batch #684

Note: When using alternative GPS location method denote in comments section of electronic worksheet "alternative GPS data used."

HPGe Measurement Identification: use numbers 1,2,4,5 (if appropriate)

Example: A2P2-PT3-1-G-D where: A2P2-PT3 = Area 2, Phase II Part Three
1 = first HPGe measurement taken in this area
G = HPGe gamma measurement
D = duplicate

Physical Sample Identification: use numbers 1, 2, 3, 4, 5 (if appropriate)

Example: A2P2-PT2-4-2-R where: A2P2 = Area 2, Phase II Part Two
4 = fourth boring in this area
2 = 1 to 2 foot sample depth interval
R = radiological analyses

2.6.2 Radon Measurements

Radon measurements will be collected and assigned a unique alpha-numeric identification:

1. Prefix designating the area name: Denotes physical sampling area or real-time measurement area: A2P2-PT2 = Area 2, Phase II Part Two

2. Monitoring activity: RADON = Radon monitoring

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3. Detector Height: A = 1 meter
B = 31 cm
C = 15 cm

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4. Measurement designator: 1, 2, 3, denotes sequential numbering of measurements

Example: A2P2-PT2-RADON-A-1 where: A2P2-PT2 = Area 2, Phase II Part Two
RADON = Radon monitoring
A = 1 meter
1 = first radon monitoring event

Table 2-1
A2PII Part Two and Part Three Sample Identifications

Boring ID	Sample ID	Northing	Easting	Depth Interval	Total Depth	TAL
A2P2-PT2-1	A2P2-PT2-1-1-M/R	479915.5	1347209.0	0-1	6.5 ft	B
A2P2-PT2-1	A2P2-PT2-1-2-V	479915.5	1347209.0	1-2	6.5 ft	B
A2P2-PT2-1	A2P2-PT2-1-3-M/R	479915.5	1347209.0	2-3	6.5 ft	B
A2P2-PT2-1	A2P2-PT2-1-4-V	479915.5	1347209.0	3-4	6.5 ft	B
A2P2-PT2-1A	A2P2-PT2-1A-1-V	479910.5	1347204.0	0-1	6.5 ft	B
A2P2-PT2-1A	A2P2-PT2-1A-3-V	479910.5	1347204.0	2-3	6.5 ft	B
A2P2-PT2-1B	A2P2-PT2-1B-1-V	479910.5	1347214.0	0-1	6.5 ft	B
A2P2-PT2-1B	A2P2-PT2-1B-3-V	479910.5	1347214.0	2-3	6.5 ft	B
A2P2-PT2-1C	A2P2-PT2-1C-1-V	479915.5	1347204.0	0-1	6.5 ft	B
A2P2-PT2-1C	A2P2-PT2-1C-3-V	479915.5	1347204.0	2-3	6.5 ft	B
A2P2-PT2-1D	A2P2-PT2-1D-1-V	479915.5	1347214.0	0-1	6.5 ft	B
A2P2-PT2-1D	A2P2-PT2-1D-3-V	479915.5	1347214.0	2-3	6.5 ft	B
A2P2-PT2-2	A2P2-PT2-2-1-M/R	479975.5	1346903.0	0-1	4.5 ft	B
A2P2-PT2-2	A2P2-PT2-2-2-V	479975.5	1346903.0	1-2	4.5 ft	B
A2P2-PT2-2A	A2P2-PT2-2A-1-V	479980.5	1346903.0	0-1	4.5 ft	B
A2P2-PT2-2B	A2P2-PT2-2B-1-V	479970.5	1346903.0	0-1	4.5 ft	B
A2P2-PT2-2C	A2P2-PT2-2C-1-V	479975.5	1346898.0	0-1	4.5 ft	B
A2P2-PT2-2D	A2P2-PT2-2D-1-V	479975.5	1346908.0	0-1	4.5 ft	B
A2P2-PT2-3	A2P2-PT2-3-1-M/R	478279.3	1346581.0	0-1	4.5 ft	C
A2P2-PT2-3	A2P2-PT2-3-2-V	478279.3	1346581.0	1-2	4.5 ft	C
A2P2-PT2-3A	A2P2-PT2-3A-1-V	478284.3	1346581.0	0-1	4.5 ft	C
A2P2-PT2-3B	A2P2-PT2-3B-1-V	478274.3	1346581.0	0-1	4.5 ft	C
A2P2-PT2-3C	A2P2-PT2-3C-1-V	478279.3	1346576.0	0-1	4.5 ft	C
A2P2-PT2-3D	A2P2-PT2-3D-1-V	478279.3	1346586.0	0-1	4.5 ft	C
A2P2-PT2-4	A2P2-PT2-4-38-V	479570.1	1346539.0	37-38	43 ft	A
A2P2-PT2-4	A2P2-PT2-4-39-R	479570.1	1346539.0	38-39	43 ft	A
A2P2-PT2-4	A2P2-PT2-4-40-R	479570.1	1346539.0	39-40	43 ft	A
A2P2-PT2-4	A2P2-PT2-4-41-V	479570.1	1346539.0	40-41	43 ft	A
A2P2-PT2-4A	A2P2-PT2-4A-39-V	479575.1	1346539.0	38-39	43 ft	A
A2P2-PT2-4A	A2P2-PT2-4A-40-V	479575.1	1346539.0	39-40	43 ft	A
A2P2-PT2-4B	A2P2-PT2-4B-39-V	479565.1	1346539.0	38-39	43 ft	A
A2P2-PT2-4B	A2P2-PT2-4B-40-V	479565.1	1346539.0	39-40	43 ft	A
A2P2-PT2-4C	A2P2-PT2-4C-39-V	479570.1	1346534.0	38-39	43 ft	A
A2P2-PT2-4C	A2P2-PT2-4C-40-V	479570.1	1346534.0	39-40	43 ft	A
A2P2-PT2-4D	A2P2-PT2-4D-39-V	479570.1	1346544.0	38-39	43 ft	A
A2P2-PT2-4D	A2P2-PT2-4D-40-V	479570.1	1346544.0	39-40	43 ft	A
A2P2-PT2-5	A2P2-PT2-5-X-R	479884.6	1346774.0	TBD	13.5 ft	A
A2P2-PT2-6	A2P2-PT2-6-X-R	479428.7	1347030.5	TBD	9.5 ft	A
A2P2-PT2-7	A2P2-PT2-7-X-R	479323.1	1346872.2	TBD	9.5 ft	A
A2P2-PT2-8	A2P2-PT2-8-X-R	479103.1	1346989.5	TBD	21.5 ft	A
A2P2-PT2-9	A2P2-PT2-9-X-R	478589.8	1346992.4	TBD	14.5 ft	A
A2P2-PT2-10	A2P2-PT2-10-X-R	478352.2	1347136.1	TBD	17.5 ft	A
A2P2-PT2-11	A2P2-PT2-11-X-R	478136.5	1347275.4	TBD	17.5 ft	A
A2P2-PT2-12	A2P2-PT2-12-X-R	479309.0	1346719.3	TBD	11.5 ft	A
A2P2-PT2-13	A2P2-PT2-13-X-R	479408.2	1346946.3	TBD	9.5 ft	A
A2P2-PT2-14	A2P2-PT2-14-X-R	479875.8	1347450.4	TBD	9.5 ft	A
A2P2-PT2-15	A2P2-PT2-15-X-R	479012.6	1347027.9	TBD	4.5 ft	A
A2P2-PT2-16	A2P2-PT2-16-X-R	478789.5	1348643.2	TBD	4.5 ft	A
A2P2-PT2-17	A2P2-PT2-17-X-R	479884.0	1346903.9	TBD	7.5 ft	A
A2P2-PT2-18	A2P2-PT2-18-X-R	479759.6	1346535.4	TBD	7.5 ft	A
A2P2-PT2-19	A2P2-PT2-19-X-R	479557.8	1346769.5	TBD	7.5 ft	A
A2P2-PT2-20	A2P2-PT2-20-X-R	478722.1	1346911.1	TBD	5.5 ft	A
A2P2-PT2-21	A2P2-PT2-21-X-R	478410.5	1346706.2	TBD	5.5 ft	A

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Table 2-1
A2PII Part Two and Part Three Sample Identifications

Boring ID	Sample ID	Northing	Easting	Depth Interval	Total Depth	TAL
A2P2-PT2-22	A2P2-PT2-22-X-R	478320.8	1346618.5	TBD	7.5 ft	A
A2P2-PT3-1	A2P2-PT3-1-X-R	478038.4	1348948.1	TBD	17.5 ft	A
A2P2-PT3-2	A2P2-PT3-2-X-R	478192.4	1348917.5	TBD	13.5 ft	A

Note: The depth interval ("X") will be determined by the beta-gamma frisk in the field.

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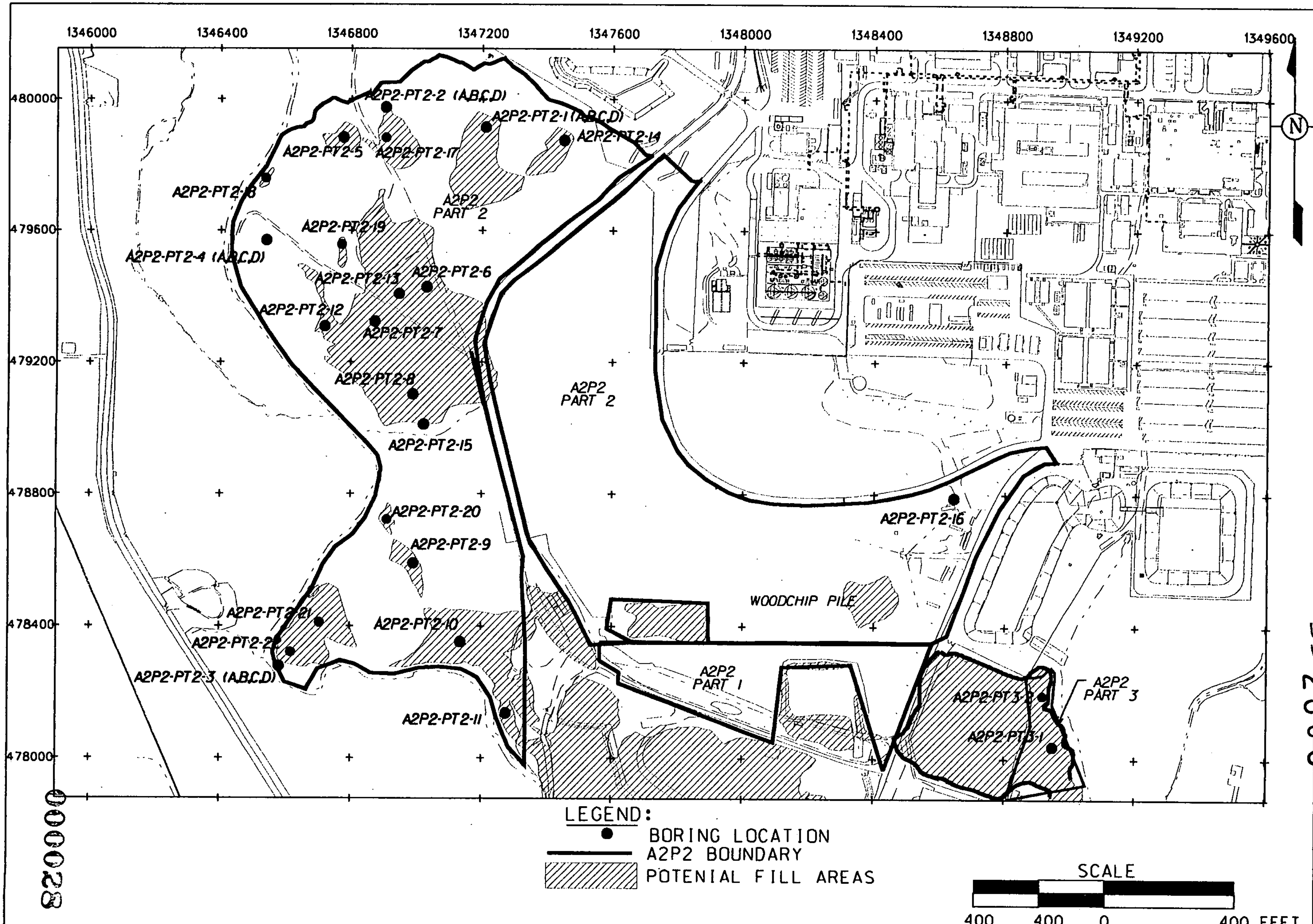

v:\2fm12\dgn\loc\a2p2-008.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-1. A2PII PART TWO AND PART THREE BORING LOCATIONS

26-OCT-1999

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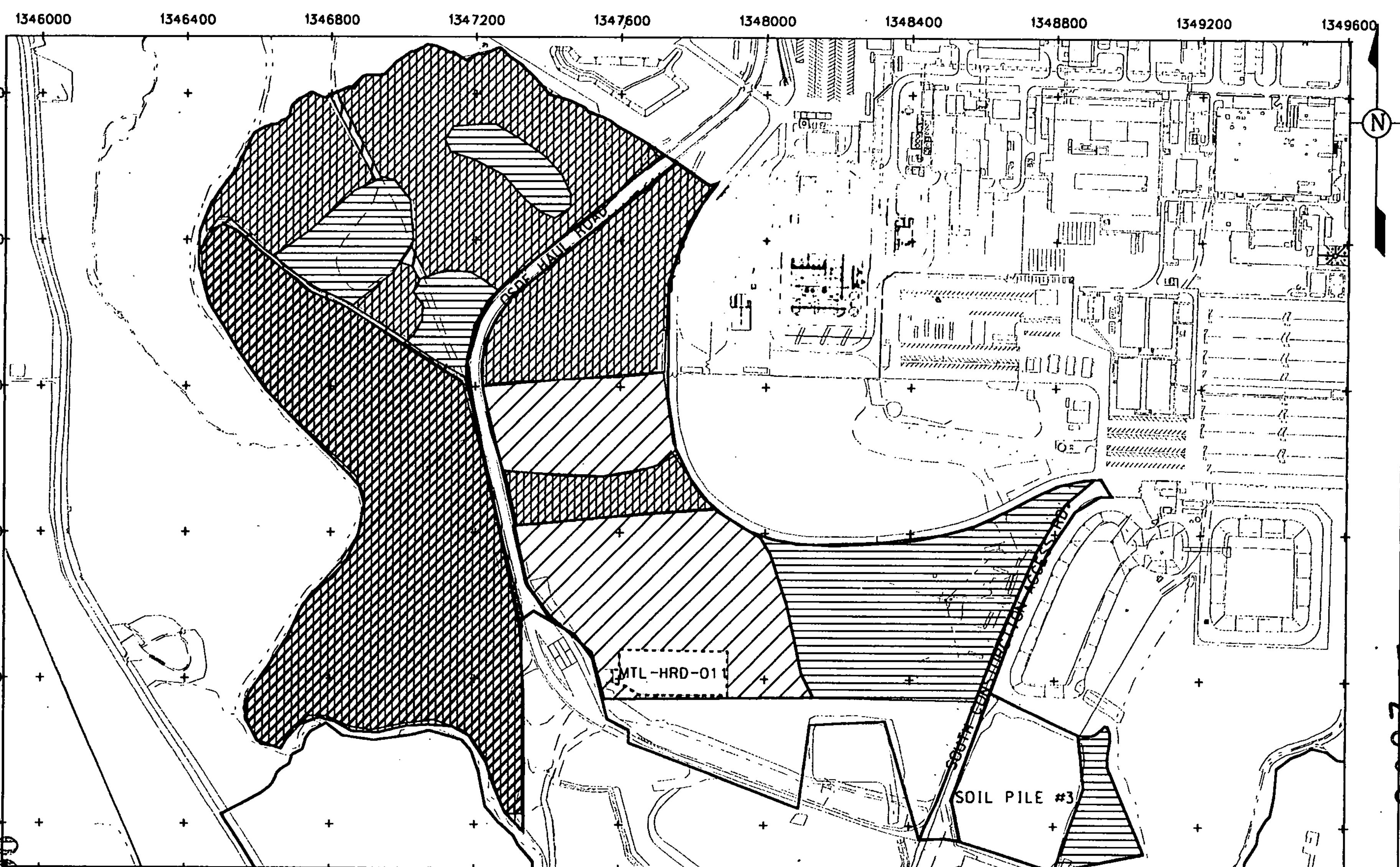

LEGEND:

- RMS ACCESSIBLE
- RMS ACCESSIBLE W/O GPS
- RMS INACCESSIBLE/HPGE ACCESSIBLE
- AREA 2 PHASE II

SCALE

400 200 0 400 FEET

FIGURE 2-2. A2PII PART TWO AND THREE REAL-TIME SCAN MEASUREMENT AREA

26-OCT-1999

STATE PLANAR COORDINATE SYSTEM 1983

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3.0 SAMPLE ANALYSIS

All soil samples collected in A2PII Parts Two and Three (with the exception of A2P2-PT2-1 through 3 and their bounding points A, B, C, D) will be submitted to the FEMP on-site laboratory and analyzed for primary radionuclides (total uranium, radium-226, radium-228, thorium-228, and thorium-232) analysis. The soil samples collected at point A2P2-PT2-1 and A2P2-PT2-2 and its bounding points (A, B, C, D) will be submitted to the FEMP on-site laboratory for analysis for primary radionuclides and arsenic. The soil samples collected at point A2P2-PT2-3 and its bounding points (A, B, C, D) will be submitted to the FEMP on-site laboratory for analysis for primary radionuclides and beryllium. The sampling and analytical requirements are listed in Table 3-1.

The necessary volume of all samples collected will be determined by the appropriate analytical method per requirements of the SEP. The TALs are shown in Table 3-1 and Appendix B. Data validation requirements are listed in Table 3-2.

If the Area Project Manager (APM) decides to analyze samples subject to methods not described in the SCQ, the APM shall ensure that:

- A V/FCN includes references confirming that the new method is sufficient to support data needs
- Variations from the SCQ methodology are documented in the PSP, or
- The APM may request data validation for affected samples or communicate to the lab that Data Qualifier Codes of J and R be attached to detected and nondetected COCs, respectively.

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TABLE 3-1
SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte	TAL	Method	Approximate Method Detection Limit	Preserve	ASL	Holding Time	Sample Mass and Container
Total Uranium	A, B, C	ICP/MS	1.0 ppm	None	B	12 months	300 g[a] minimum Place 12-inch interval in 500 mL container Glass container with Teflon-lined lids necessary for Arsenic and Beryllium samples
		Alpha Spec	0.6 ppm		B		
		Gamma Spec	5-6 ppm		E[b]		
Thorium-228 and Thorium-232	A, B, C	Alpha Spec	0.2 pCi/g	None	B	12 months	
		Gamma Spec	0.2 pCi/g				
Radium-226	A, B, C	Alpha Spec	0.6 pCi/g	None	B	12 months	
		Gamma Spec	0.6 pCi/g				
Radium-228	A, B, C	Alpha Spec	1.0 pCi/g	None	B	12 months	
		Gamma Spec	1.0 pCi/g				
Arsenic	B	ICP/MS	1 ppm	Cool, 2-6° C	B	180 days	
		ICP-AES	3-5 ppm				
Beryllium	C	ICP/MS	1 ppm	Cool, 2-6° C	B	180 days	
		ICP-AES	0.1 ppm				

[a] A mass total of 300 grams is needed for analysis for each sample collected
[b] ASL E due to higher detection limit; same lab QA/QC as ASL B applies to ASL E

Note: TAL B or C sample material can be combined in one sample container with TAL A since there is enough material and cooling preservation does not adversely impact primary radionuclide analysis.

TABLE 3-2
DATA VALIDATION REQUIREMENTS

ASL Level	Percent Validated
ASL A	No data validation required
ASL B	10 percent data validation required

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4.0 QUALITY ASSURANCE REQUIREMENTS

Physical sampling and real-time data collection will be performed in accordance with the requirements in the latest revision of the SCQ and SCQ Addendum. The DQO for physical sampling under this plan is DQO SL-048, Delineating the Extent of Constituents of Concern During Remediation Sampling, Revision 5 and the DQO for real-time characterization is DQO SL-056, Real-Time FRL Monitoring, Revision 0 (Appendix A).

4.1 SURVEILLANCE

Project management has the ultimate responsibility for the quality of the work processes and the results of the sampling/monitoring activities covered by this plan. The FEMP Quality Assurance (QA) organization may conduct independent assessments of the work processes and operations to assure the quality of performance. The assessment will encompass technical and procedural requirements of this PSP and the SCQ. Independent assessments may be performed by conducting surveillances.

4.2 IMPLEMENTATION OF FIELD CHANGES

If field conditions require changes or variances, verbal approval must be obtained from the Characterization Lead, WAO representative, and QA representative or their designees before the changes can be implemented (electronic mail is acceptable as document approval). Changes to the PSP will be noted in the applicable Field Activity Logs and on a V/FCN. QA must receive the completed V/FCN, with the signatures of the Project Manager, Characterization Lead, WAO representative, and the QA representative within seven working days of granting verbal approval.

5.0 SAFETY AND HEALTH

Personnel will conform to precautionary surveys by FEMP personnel representing the Utility Engineer, Industrial Hygiene, Occupational Safety, and Radiological Control.

All work performed on this project will be performed in accordance to applicable Environmental Monitoring project procedures, Radiological Control Requirements Manual (RM-0021), Safety Performance Requirements Manual, FDF work permit, radiological work permits, penetration permits, and other applicable permits. Concurrence with all applicable safety permits is required by all personnel in the performance of their assigned duties.

All personnel involved in the collection of soil samples will be briefed on this PSP and the briefing will be documented. Personnel who do not receive a briefing on these requirements will not participate in the execution of soil sampling activities related to the completion of assigned project responsibilities.

All emergencies shall be reported immediately on extension 911, or to the Site Communications Center at 648-6511 (if using a cellular phone), or by using a radio and contacting "CONTROL" on channel 11.

6.0 DATA MANAGEMENT

The RTIMP group will provide hard copy maps and/or summary reports to the Characterization Lead and Data Management Lead or designees. All real-time data will be collected and reported at a minimum ASL A and require no data validation. All physical samples measurements will be collected and reported at ASL B and will require 10 percent data validation. All electronically recorded field data will have the RMS or HPGe Data Verification Checklist (Section 5.4 of the User's Manual), which will be completed after each data collection event. Field documentation, such as the Nuclear Field Density/Moisture Worksheet, will undergo an internal review by the RTIMP.

Electronically recorded data from the GPS, HPGe, and RMS systems will be downloaded on a daily basis to disks, or to the Local Area Network (LAN) using the Ethernet connection. The Characterization Lead or designee will be informed by the RTIMP Lead or designee when RTIMP measurements do not meet data quality control checklist criteria. The Characterization Lead or designee will determine whether additional scanning, confirmation, or delineation measurements are required.

Once the electronic data have been placed on the LAN and SED, the Data Management Lead will perform an evaluation prior to placement on the Soil and Disposal Facility Project (SDFP) web site. The evaluation may involve a comparison check between the electronic data, hard copy maps and summary reports for accuracy and completeness. The evaluation will be documented on the Real-Time Electronic Data Quality Control checklist (Figure 6-1), dated and signed.

Technicians and the field sampling data coordinator will review all field data for completeness and accuracy and then forward the data package to the Data Validation Contact for final review. The field data package will be filed in the records of the Environmental Management Project.

The Sample and Data Management organization will perform data entry into the SED for physical sampling and analytical results. After the sample data are in the SED, the Data Group Form (FS-F-5157) will be completed by the Characterization Lead with concurrence from a WAO representative.

Copies of field documentation shall be generated and provided to the Characterization Lead or Data Management Lead upon request and maintained in SDFP project files until dispositioned to Engineering/Construction Document Control (ECDC). RTIMP will maintain all the real-time files and survey data will be maintained by the Survey Lead or designee. All records associated with this PSP will reference the PSP number and eventually be forwarded to ECDC to be placed in the project file.

PSP/Project #:______________

Batch Numbers:______________

HPGe file Numbers:______________

REAL-TIME ELECTRONIC DATA QUALITY CONTROL CHECKLIST

F-2606

#	ITEM TO BE CHECKED	✔ or No	Modification/Correction with explanation	Date Corrected
1	Receive the Characterization Request form, Monitoring Form (MF), coverage maps, real-time verification checklist, and/or HPGe parameter summary report from the Characterization field personnel			
2	Verify the signatures and all blanks on the MF are complete through Section 6 and complete on the Real-Time Verification Checklist			
3	Check loader to ensure the data transferred from the LAN to the SED (if the data files are in the SED, the loader is working properly)			
4	Check to ensure data transferred into the correct fields by looking at the data on the LAN in comparison with the data transferred to the SED (to verify this, all data fields for a few runs in each file will be reviewed)			
5	Check that the project number is correct and is consistent on the MF, the LAN, and the SED in both the worksheet files and the results/data files			
6	Check that the MF, the LAN, and the SED have the correct location identifier in both the worksheet files and the results/data files			
7	Check that worksheet on the LAN and in the SED have the correct elevation documented from the surveying group			
8	Verify northing and easting coordinates, look at the plotted map and the coordinates in the SED and verify the coordinates are within the boundary on the plotted map			
9	Check data files to ensure all files are received			
10	Attach this checklist and documentation for modifications to the EMF, initial and date all forms and documentation		X	X
11	Insert USE into the "QC Field" on the SED after all this has been checked and verified correct		X	X

Sign and Date______________

FIGURE 6-1

PSP/Project #:____________________

Batch Numbers:____________________

HPGe file Numbers:____________________

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1. If no, check with the Characterization Lead or designee to get needed forms.

2. If no, contact Characterization Lead and return MF to be completed and/or signed.

3. If no, check with SED Database Manager (ext. 7544) to find out why.

4. If no, check with the Real-Time Field Lead to see if any additional fields were added. If so, call SED Database Manager (ext. 7544) to have the field added into the SED tables. If not, check with SED Database Manager (ext. 7544) to see why the fields loaded incorrectly.

5. If no, verify the correct project number with the Characterization Lead and insert the project number into the worksheet on the LAN and the worksheet in the SED; attach the documentation to the form.

6. If no, verify with the Characterization Lead the correct identifier and correct the identifier both in the worksheet on the LAN and in the SED; attach the documentation to the form.

7. If no, check with the Surveying group to verify the elevation; If incorrect, change the elevation in the worksheet on the LAN and in the SED and attach the documentation to the form.

8. If no, check with Characterization Lead or designee to resolve the problem.

9. Run query in SED. The number of RTRAK/RSS files can be checked with the number of records (files) listed in the SRDIG directory under Real-Time Lab View files. No sequential gaps are anticipated; if gaps are found, check with the Real-Time Field Lead. The Real-Time Field Lead will verify gaps or will investigate to find out why the files are missing. For HPGe shots, an HPGe Data Verification Checklist is attached to the MF listing all the files. This Checklist can be used to ensure all the files were received in the SED.

Sign and Date____________________

FIGURE 6-1

7.0 APPLICABLE DOCUMENTS, METHODS, AND STANDARDS

Excavation characterization activities described in this plan shall follow the requirements outlined in the following documents, procedures, and standard methods (including the latest revision of each document):

- Sitewide Excavation Plan (SEP)
- WAC Attainment Plan for the OSDF
- Impacted Materials Placement Plan
- User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectroscopy at the Fernald Site (User's Manual)
- Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality (SCQ) Assurance Project Plan
- In-Situ Gamma Spectroscopy Addendum to the Sitewide CERCLA Quality Assurance Project Plan
- RTRAK Applicability Study
- Real-Time Instrumentation Measurement Program Quality Assurance Plan
- Delineating the Extent of Constituents of Concern During Remediation Sampling, DQO SL-048
- Real-Time FRL Monitoring, DQO SL-056
- ADM-02, Field Project Prerequisites
- ADM-16, In-Situ Gamma Spectrometry Quality Control Measurement
- ADM-17, In-Situ Gamma Spectrometry Data Management
- ADM-19, In-Situ Gamma Spectrometry Field Prerequisites
- EP-0003, Unexpected Discovery of Cultural Resources
- EQT-05, Geodimeter® 4000 Surveying System
- EQT-22, High Purity Germanium Detector In-Situ Efficiency Calibration
- EQT-23, High Purity Germanium Detectors

- EQT-32, Troxler 3440 Series Surface Moisture/Density Gauge
- EQT-33, Real-Time Differential Global Positioning System Operation
- EQT-39, Zeltex Infrared Moisture Meter
- EQT-41, Radiation Measuring Systems
- SMPL-01, Solids Sampling

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APPENDIX A

DATA QUALITY OBJECTIVES SL-048, REVISION 5 AND SL-056, REVISION 0

Control Number =-2606

Fernald Environmental Management Project

Data Quality Objectives

Title: Delineating the Extent of Constituents of Concern During Remediation Sampling

Number: SL-048

Revision: 5

Effective Date: February 26, 1999

Contact Name: Eric Kroger

Approval: (signature on file) Date: 2/25/99
James E. Chambers
DQO Coordinator

Approval: (signature on file) Date: 2/26/99
J.D. Chiou
SCEP Project Director

Rev. #	0	1	2	3	4	5	6
Effective Date:	9/19/97	10/3/97	4/15/98	6/17/98	7/14/98	2/26/99	

DATA QUALITY OBJECTIVES

Delineating the Extent of Constituents of Concern During Remediation Sampling

Members of Data Quality Objectives (DQO) Scoping Team

The members of the DQO team include a project lead, a project engineer, a field lead, a statistician, a lead chemist, a sampling supervisor, and a data management lead.

Conceptual Model of the Site

Media is considered contaminated if the concentration of a constituent of concern (COC) exceeds the final remediation levels (FRLs). The extent of specific media contamination was estimated and published in the Operable Unit 5 Feasibility Study (FS). These estimates were based on kriging analysis of available data for media collected during the Remedial Investigation (RI) effort and other FEMP environmental characterization studies. Maps outlining contaminated media boundaries were generated for the Operable Unit 5 FS by overlaying the results of the kriging analysis data with isoconcentration maps of the other constituents of concern (COCs), as presented in the Operable Unit 5 RI report, and further modified by spatial analysis of maps reflecting the most current media characterization data. A sequential remediation plan has been presented that subdivides the FEMP into seven construction areas. During the course of remediation, areas of specific media may require additional characterization so remediation can be carried out as thoroughly and efficiently as possible. As a result, additional sampling may be necessary to accurately delineate a volume of specific media as exceeding a target level, such as the FRL or the Waste Attainment Criterion (WAC). Each individual Project-Specific Plan (PSP) will identify and describe the particular media to be sampled. This DQO covers all physical sampling activities associated with Pre-design Investigations, precertification sampling, WAC attainment sampling or regulatory monitoring that is required during site remediation.

1.0 Statement of Problem

If the extent (depth and/or area) of the media COC contamination is unknown, then it must be defined with respect to the appropriate target level (FRL, WAC, or other specified media concentration).

2.0 Identify the Decision

Delineate the horizontal and/or vertical extent of media COC contamination in an area with respect to the appropriate target level.

3.0 Inputs That Affect the Decision

Informational Inputs - Historical data, process history knowledge, the modeled extent of COC contamination, and the origins of contamination will be required to establish a sampling plan to delineate the extent of COC contamination. The desired precision of the delineation must be weighed against the cost of collecting and analyzing additional samples in order to determine the optimal sampling density. The project-specific plan will identify the optimal sampling density.

Action Levels - COCs must be delineated with respect to a specific action level, such as FRLs and On-Site Disposal Facility (OSDF) WAC concentrations. Specific media FRLs are established in the OU2 and OU5 RODs, and the WAC concentrations are published in the OU5 ROD. Media COCs may also require delineation with respect to other action levels that act as remediation drivers, such as Benchmark Toxicity Values (BTVs).

4.0 The Boundaries of the Situation

Temporal Boundaries - Sampling must be completed within a time frame sufficient to meet the remediation schedule. Time frames must allow for the scheduling of sampling and analytical activities, the collection of samples, analysis of samples and the processing of analytical data when received.

Scale of Decision Making - The decision made based upon the data collected in this investigation will be the extent of COC contamination at or above the appropriate action level. This delineation will result in media contaminant concentration information being incorporated into engineering design, and the attainment of established remediation goals.

Parameters of Interest - The parameters of interest are the COCs that have been determined to require additional delineation before remediation design can be finalized with the optimal degree of accuracy.

5.0 Decision Rule

If existing data provide an unacceptable level of uncertainty in the COC delineation model, then additional sampling will take place to decrease the model uncertainty. When deciding what additional data is needed, the costs of additional sampling and analysis must be weighed against the benefit of reduced uncertainty in the delineation model, which will eventually be used for assigning excavation, or for other purposes.

6.0 Limits on Decision Errors

In order to be useful, data must be collected with sufficient areal and depth coverage, and at sufficient density to ensure an accurate delineation of COC concentrations. Analytical sensitivity and reproducibility must be sufficient to differentiate the COC concentrations below their respective target levels.

Types of Decision Errors and Consequences

Decision Error 1 - This decision error occurs when the decision maker determines that the extent of media contaminated with COCs above action levels is not as extensive as it actually is. This error can result in a remediation design that fails to incorporate media contaminated with COC(s) above the action level(s). This could result in the re-mobilization of excavation equipment and delays in the remediation schedule. Also, this could result in media contaminated above action levels remaining after remediation is considered complete, posing a potential threat to human health and the environment.

Decision Error 2 - This decision error occurs when the decision maker determines that the extent of media contaminated above COC action levels is more extensive than it actually is. This error could result in more excavation than necessary, and this excess volume of materials being transferred to the OSDF, or an off-site disposal facility if contamination levels exceed the OSDF WAC.

True State of Nature for the Decision Errors - The true state of nature for Decision Error 1 is that the maximum extent of contamination above the FRL is more extensive than was determined. The true state of nature for Decision Error 2 is that the maximum extent of contamination above the FRL is not as extensive as was determined. Decision Error 1 is the more severe error.

7.0 Optimizing Design for Useable Data

7.1 Sample Collection

A sampling and analytical testing program will delineate the extent of COC contamination in a given area with respect to the action level of interest. Existing data, process knowledge, modeled concentration data, and the origins of contamination will be considered when determining the lateral and vertical extent of sample collection. The cost of collecting and analyzing additional samples will be weighed against the benefit of reduced uncertainty in the delineation model. This will determine the sampling density. Individual PSPs will identify the locations and depths to be sampled, the sampling density necessary to obtain the desired accuracy of the delineation, and if samples will be analyzed by the on-site or off-site laboratory. The PSP will also identify the sampling increments to be selectively analyzed for concentrations of the COC(s) of interest, along with field work requirements. Analytical requirements will be listed in the PSP. The chosen analytical methodologies are able to achieve a detection limit capable of resolving the COC action level. Sampling of groundwater monitoring wells may require different purge requirements than those stated in the SCQ (i.e., dry well definitions or small purge volumes). In order to accommodate sampling of wells that go dry prior to completing the purge of the necessary well volume, attempts to sample the monitoring wells will be made 24 hours after purging the well dry. If, after the 24 hour period, the well does not yield the required volume, the analytes will be collected in the order stated in the applicable PSP until the well goes dry. Any remaining analytes will not be collected. In some instances, after the 24 hour wait the well may not yield any water. For these cases, the well will be considered dry and will not be sampled.

7.2 COC Delineation

The media COC delineation will use all data collected under the PSP, and if deemed appropriate by the Project Lead, may also include existing data obtained from physical samples, and if applicable, information obtained through real-time screening. The delineation may be accomplished through modeling (e.g. kriging) of the COC concentration data with a confidence limit specific to project needs that will reduce the potential for Decision Error 1. A very conservative approach to delineation may also be utilized where the boundaries of the contaminated media are extended to the first known vertical and horizontal sample locations that reveal concentrations below the desired action level.

7.3 QC Considerations

Laboratory work will follow the requirements specified in the SCQ. If analysis is to be carried out by an off-site laboratory, it will be a Fluor Daniel Fernald approved full service laboratory. Laboratory quality control measures include a media prep blank, a laboratory control sample (LCS), matrix duplicates and matrix spike. Typical Field QC samples are not required for ASL B analysis. However the PSPs may specify appropriate field QC samples for the media type with respect to the ASL in accordance with the SCQ, such as field blanks, trip blanks, and container blanks. All field QC samples will be analyzed at the associated field sample ASL. Data will be validated per project requirements, which must meet the requirements specified in the SCQ. Project-specific validation requirements will be listed in the PSP.

Per the Sitewide Excavation Plan, the following ASL and data validation requirements apply to all **soil and soil field QC samples** collected in association with this DQO:

- If samples are analyzed for Pre-design Investigations and/or Precertification, 100% of the data will be analyzed per ASL B requirements. For each laboratory used for a project, 90% of the data will require only a Certificate of Analysis, the other 10% will require the Certificate of Analysis and all associated QA/QC results, and will be validated to ASL B. Per Appendix H of the SEP, the minimum detection level (MDL) for these analyses will be established at approximately 10% of the action level (the action level for precertification is the

FRL; the action level for pre-design investigations can be several different action levels, including the FRL, the WAC, RCRA levels, ALARA levels, etc.). If this MDL is different from the SCQ-specified MDL, the ASL will default to ASL E, though other analytical requirements will remain as specified for ASL B.

- If samples are analyzed for WAC Attainment and/or RCRA Characteristic Areas Delineation, 100% of the data will be analyzed and reported to ASL B with 10% validated. The ASL B package will include a Certificate of Analysis along with all associated QA/QC results. Total uranium analyses using a higher detection limit than is required for ASL B (10 mg/kg) may be appropriate for WAC attainment purposes since the WAC limit for total uranium is 1,030 mg/kg. In this case, an ASL E designation will apply to the analysis and reporting to be performed under the following conditions:

    - all of the ASL B laboratory QA/QC methods and reporting criteria will apply with the exception of the total uranium detection limit

    - the detection limit will be ≤10% of the WAC limit (e.g., ≤103 mg/kg for total uranium).

- If delineation data are also to be used for certification, the data must meet the data quality objectives specified in the Certification DQO (SL-043).

- Validation will include field validation of field packages for ASL B or ASL D data.

All data will undergo an evaluation by the Project Team, including a comparison for consistency with historical data. Deviations from QC considerations resulting from evaluating inputs to the decision from Section 3, must be justified in the PSP such that the objectives of the decision rule in Section 5 are met.

7.4 Independent Assessment

Independent assessment shall be performed by the FEMP QA organization by conducting surveillances. Surveillances will be planned and documented in accordance with Section 12.3 of the SCQ.

7.5 Data Management

Upon receipt from the laboratory, all results will be entered into the SED as qualified data using standard data entry protocol. The required ASL B, D or E data will undergo analytical validation by the FEMP validation team, as required (see Section 7.3). The Project Manager will be responsible to determine data usability as it pertains to supporting the DQO decision of determining delineation of media

COC's.

7.6 Applicable Procedures

Sample collection will be described in the PSP with a listing of applicable procedures. Typical related plans and procedures are the following:

- Sitewide Excavation Plan (SEP)
- Sitewide CERCLA Quality Assurance Project Plan (SCQ).
- SMPL-01, *Solids Sampling*
- SMPL-02, *Liquids and Sludge Sampling*
- SMPL-21, *Collection of Field Quality Control Samples*
- EQT-06, *Geoprobe® Model 5400 Operation and Maintenance*
- EQT-23, *Operation of High Purity Germanium Detectors*
- EQT-30, *Operation of Radiation Tracking Vehicle Sodium Iodide Detection System*

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Data Quality Objectives
Delineating the Extent of Constituents of Concern During Remediation Sampling

1A. Task/Description: Delineating the extent of contamination above the FRLs

1.B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☒ RA ☐ R_vA ☐ OTHER ☐

1.C. DQO No.: SL-048, Rev. 5 DQO Reference No.:__________

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2. Media Characterization: (Put an X in the appropriate selection.)

Air ☐ Biological ☐ Groundwater ☒ Sediment ☒ Soil ☒

Waste ☒ Wastewater ☐ Surface water ☐ Other (specify) _____

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3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization
A ☐ B ☒ C ☐ D ☒ E ☒

Risk Assessment
A ☐ B ☐ C ☐ D ☐ E ☐

Evaluation of Alternatives
A ☐ B ☐ C ☐ D ☐ E ☐

Engineering Design
A ☐ B ☒ C ☐ D ☒ E ☒

Monitoring during remediation
A ☒ B ☒ C ☐ D ☒ E ☒

Other
A ☐ B ☐ C ☐ D ☐ E ☐

4.A. Drivers: Remedial Action Work Plans, Applicable or Relevant and Appropriate Requirements (ARARs) and the OU2 and/or OU5 Record of Decision (ROD).

4.B. Objective: Delineate the extent of media contaminated with a COC (or COCs) with respect to the action level(s) of interest.

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5. Site Information (Description):

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6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1. pH	[X] *	2. Uranium	[X] *	3. BTX	[ ]
Temperature	[X] *	Full Radiological	[X] *	TPH	[ ]
Specific Conductance	[X] *	Metals	[X] *	Oil/Grease	[ ]
Dissolved Oxygen	[X] *	Cyanide	[ ]		
Technetium-99	[X] *	Silica	[ ]		

4. Cations	[ ]	5. VOA	[X] *	6. Other (specify)
Anions	[ ]	BNA	[X] *	
TOC	[ ]	Pesticides	[X] *	
TCLP	[X] *	PCB	[X] *	
CEC	[ ]	COD	[ ]	

*If constituent is identified for delineation in the individual PSP.

6.B. Equipment Selection and SCQ Reference:

Equipment Selection	Refer to SCQ Section
ASL A ______	SCQ Section: ______
ASL B X	SCQ Section: App. G Tables G-1&G-3
ASL C ______	SCQ Section: ______
ASL D X	SCQ Section: App. G Tables G-1&G-3
ASL E X (See sect. 7.3, pg. 6)	SCQ Section: App. G Tables G-1&G-3

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased	[X]	Composite	[ ]	Environmental	[X]	Grab	[X]	Grid	[X]
Intrusive	[X]	Non-Intrusive	[ ]	Phased	[ ]	Source	[ ]		

DQO Number: SL-048, Rev. 5

7.B. Sample Work Plan Reference: This DQO is being written prior to the PSPs.

Background samples: OU5 RI

7.C. Sample Collection Reference:

Sample Collection Reference: SMPL-01, SMPL-02, EQT-06

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8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	[X]*	Container Blanks	[X]++
Field Blanks	[X]+	Duplicate Samples	[X]***
Equipment Rinsate Samples	[X]***	Split Samples	[X]**
Preservative Blanks	[ ]	Performance Evaluation Samples	[ ]
Other (specify)			

- * For volatile organics only
- ** Split samples will be collected where required by EPA or OEPA.
- *** If specified in PSP.
- + Collected at the discretion of the Project Manager (if warranted by field conditions)
- ++ One per Area and Phase Area per container type (i.e. stainless steel core liner/plastic core liner/Geoprobe tube).

8.B. Laboratory Quality Control Samples:

Method Blank	[X]	Matrix Duplicate/Replicate	[X]
Matrix Spike	[X]	Surrogate Spikes	[ ]
Tracer Spike	[ ]		

Other (specify) Per SCQ

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

Control Number: 2606

Fernald Environmental Management Project

Data Quality Objectives

Title: Real Time Final Remediation Level (FRL) Monitoring

Number: SL-056

Revision: 0

Effective Date: 9/01/99

Contact Name: Joan White

Approval: J. E. Chambers Date: 9/1/99
James Chambers
DQO Coordinator

Approval: Joan White Date: 9/1/99
Joan White
Real-Time Instrumentation Measurement
Program Manager

Rev. #	0						
Effective Date:	9/01/99						

Data Quality Objectives
Real Time Final Remediation Level (FRL) Monitoring

1.0 Statement of Problem

Conceptual Model of the Site

The general soil remediation process at the Fernald Environmental Management Project (FEMP) includes real-time *in-situ* gamma spectrometry (real-time) measurements and physical sampling during different phases of the remediation process. Initially, pre-design investigations define excavation boundaries. During excavation, real-time measurements and/or sampling for waste disposition issues occurs. After planned excavations are complete, real-time measurements and/or physical sampling precertification activities are carried out to verify that residual contamination is below final remediation levels (FRLs).

This DQO describes the real-time in-situ gamma spectrometry methods used for gamma resolvable Area Specific Contaminants of Concern (ASCOC) FRL monitoring to support remedial design and precertification. Any physical soil samples collected to support remedial design will be collected under a separate DQO. Real-time FRL measurements involve field surveys of the surface soil using mobile and stationary gamma-discernable real-time equipment. Real-time FRL measurements are collected within an area when above-FRL radiological contamination is anticipated to be minimal based on process knowledge or previous investigations.

FRL scanning activities must follow the guidelines established in the *Sitewide Excavation Plan* (SEP) and the most current version of the document *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site* (hereinafter referred to as the Real Time Users Manual). As discussed in these documents, FRL measurements are conducted in two separate activities:

- FRL Phase I includes a mobile sodium iodide (NaI) detector scan of as much of the area as accessible at a 31 cm detection height at 1 mile per hour. If parts of the area of interest are inaccessible to the mobile NaI detectors, then the stationary High Purity Germanium (HPGe) detector will be used to obtain measurements in those areas. Target parameters for FRL Phase I NaI measurements are gross gamma activity and 3-times the FRL (3x FRL) values of total uranium, radium-226 and/or thorium-232, as calculated by a moving two-point average of consecutive measurements, or as indicated by 2x FRL in single measurements using the HPGe detectors at a 1 meter detector height.

- FRL Phase II includes stationary HPGe "hot spot evaluation" measurements at Phase I locations where the two-point average of total uranium, radium-226 and/or thorium-232 has identified resolvable ASCOC concentrations greater than 3-times the FRL (3x FRL) using the RMS systems, or where single HPGe measurement from Phase I are greater than 2x FRL. Target parameters for FRL Phase II are all gamma resolvable radiological ASCOCs.

Available Resources

Time: FRL investigation of remediation areas or phased areas must be accomplished by the field team of real-time instrumentation operators (and samplers if necessary), to provide required information in time to support the design effort.

Project Constraints: FEMP remediation activities are being performed in support of the Accelerated Remediation Plan, and soil remediation activities must be consistent with the SEP. FRL scanning, and if necessary, sampling and analytical testing, must be performed with existing manpower and instrumentation, considering instrument availability, to support the remediation and certification schedule. The results of FRL Phase I will determine Phase II HPGe measurement location and if necessary, will determine physical sample location. Design and execution of potential remediation is dependent on successful completion of this work.

Instrumentation: Real-time monitoring includes mobile sodium iodide (NaI) systems referred to as the Radiation Measurement Systems (RMS). In addition, stationary germanium detectors mounted on a tripod (the HPGe), are also used. These instruments can significantly accelerate the pace of necessary characterization by detecting soil contaminated with gamma resolvable radiological ASCOCs in a rapid and non-intrusive manner.

2.0 Identify the Decision

Decision

Delineate the horizontal extent of above-FRL (hot spot criteria) radiological contamination in the area soil. In addition, determine the need for Phase II real-time measurements to further assist in the above-FRL delineation.

3.0 Identify Inputs That Affect the Decision

Required Informational Input

Real-time FRL measurements will be used to estimate the surface soil contamination and the variation in surface soil contamination in areas scheduled for design, modeling, precertification, or certification activities. In addition, RTIMP data may be used to determine physical sampling collection location and/or a review of existing physical sample data, process knowledge, or visible observation.

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Sources of Informational Input

FRL measurements for gamma discernible radiological COCs will involve measurements from mobile and stationary in-situ gamma spectrometry equipment. Physical samples may be collected to verify real-time measurements, or to investigate non-gamma resolvable ASCOCs.

Action Levels

FRLs established in the OU2 and OU5 Records of Decision are specific for radiological COC, and in some cases, vary between remediation areas. The FRLs were developed to account for health risks, cross media impact, background concentrations, and applicable or relevant and appropriate requirements (ARARs) and represent not-to-exceed contaminant-specific average soil concentrations. Real-time HPGe measurements may also be taken to support excavation to ALARA requirements. Physical samples may be used to verify HPGe readings and to precertify for non-gamma resolvable ASCOCs.

The 3x FRL concentrations/activities obtained through two-point averaging of mobile NaI measurements have been developed based on the ability of the instrumentation to resolve these levels. Refer to the Real-Time User's Manual for additional details.

Methods of Data Collection

FRL Phase I measurements will be utilized to obtain as close to complete coverage of the areas of concern. Hot spot confirmation and delineation measurements will be obtained during FRL Phase II by strategically placed stationary HPGe measurements. Analysis and data management for FRL Phase I data will be conducted at ASL A. FRL Phase II data may be conducted at either ASL A or ASL B, at the discretion of the Project. The decision to collect Phase II data at ASL A, or ASL B will depend on the Project's need for validated data. Only ASL B data is subject to validation, at project request. Real-time data collection for Phase II ASL A and ASL B measurements are identical. All measurements will be performed in compliance with operating procedures, the Real-Time User's Manual, the SEP, and the SCQ.

The FRL Phase I data will be utilized to establish general radiological concentration patterns and detect areas of elevated total gamma activity, as well as provide isotopic information for resolvable ASCOCs. The FRL Phase II HPGe gamma detectors will be used to confirm and delineate Phase I potential hot spot measurements, as needed. All real-time Phase I and Phase II measurements will be collected in accordance with the procedures identified in Section 7.0 of this DQO.

Surface physical samples may be collected to verify HPGe measurements for non-gamma resolvable ASCOCs. If physical sampling is needed, it will be identified in PSPs. The data quality of these samples will be consistent with the latest sampling DQO.

4.0 The Boundaries of the Situation

Spatial Boundaries

Domain of the Decision: Boundaries are limited to surface soils of areas planned for certification, and adjacent areas, as defined in the individual work plans.

Population of Soils: The soils affected are surface soils (to a nominal depth of 6 inches), which include recently excavated surfaces and undisturbed soils associated with excavation areas as designated in the individual work plans.

Temporal Boundaries

Time Constraints on Real-Time Measurements: The scheduling of FRL scanning is closely associated with the design process and excavation schedule. FRL real-time scanning must be conducted prior to design, excavation, if any, and before certification activities begin. The scanning data must be returned and processed into useable format in time for the information to be useful within the current remediation schedule.

Practical Considerations: In-situ gamma spectrometry measurements cannot be made during snow coverage or standing water conditions or during precipitation. Field analytical methods should also be limited to unsaturated soils. Most areas undergoing scanning are flat, open terrain, and are readily accessible to the equipment. Some areas may require preparation, such as cutting of grass or removal of undergrowth, fencing and other obstacles. In situ measurements will require coordination with appropriate maintenance personnel for site preparation. Physical and environmental parameters will be recorded and assessed during data collection. Refer to the Real-Time User's Manual for additional details.

5.0 Develop a Logic Statement

Parameters of Interest

For FRL Phase I, parameters of interest are gross gamma activity and 3-times the FRL values of total uranium, radium-226 and thorium-232, as calculated by a moving two-point average of consecutive readings. For FRL Phase II, parameters of interest are all HPGe-discernable radiological ASCOCs.

FRL Target Levels

For FRL Phase I, target levels are the highest gross gamma activity readings, 3x FRL for total uranium, radium-226 and thorium-232, and WAC trigger levels for total uranium. For FRL Phase II, target levels are the FRLs of all gamma discernable radiological ASCOCs including the WAC trigger level for total uranium.

Decision Rules

Following FRL Phase I, any Phase I NaI scanned areas exhibiting patterns of high gross gamma activity will be measured with the HPGe. Also, any Phase I HPGe measurements greater than 3x FRL will be scanned with the HPGe for hot spot evaluation per section 3.3 of the Real-Time User's Manual.

Following FRL Phase II, if HPGe results indicate an area could fail FRLs, the soil may be evaluated further with additional HPGe measurements or physical samples, or undergo remedial excavations. If remedial excavations are performed, the excavated area will be measured with post-excavation HPGe measurements to ensure removal of the contamination. Once the remediation is complete, FRL attainment is confirmed by the HPGe.

6.0 Establish Constraints on the Uncertainty of the Decision

Range of Parameter Limits

The range of surface soil concentrations anticipated will be from background (natural concentrations) to greater than 3X FRL.

Types of Decision Errors and Consequences

Decision Error 1: This decision error occurs when the decision maker decides an area meets FRLs when the average soil concentration in an area is above the FRL, or the soil contains ASCOC concentrations above the hot spot criteria (3x FRL for hot spots $\leq 10\ m^2$, or 2x FRL for hot spots $> 10\ m^2$). This decision error would lead to the area failing certification for average radiological COC concentrations above the FRL or for hot spot criteria. If an area fails certification sampling and analytical testing, remobilization and further excavation, precertification, and certification sampling would be necessary.

Decision Error 2: This decision error occurs when the decision maker decides that additional HPGe and/or physical samples are necessary based on FRL Phase II results; or the decision maker directs the excavation (or additional excavation) of soils, when they actually have average radiological COC concentrations below the FRLs and no ASCOC hot spots (3x FRL for hot spots $\leq 10\ m^2$, or 2x FRL for hot spots $> 10\ m^2$). This would result in added sampling and analytical costs and/or added costs due to the excavation of clean soils and an increased volume in the OSDF. This is not as severe as Decision Error 1. The addition of clean soil to the

OSDF would result in further reduction, although minimally, to human health risk in the remediated areas.

True State of Nature for the Decision Errors

The true state of nature for Decision Error 1 is that the actual concentrations of radiological ASCOCs are greater than their FRLs and/or the hot spot criteria. The true state of nature for Decision Error 2 is that the true concentrations of COCs are below their FRLs and/or hot spot criteria. Decision Error 1 would be the more severe error.

7.0 Optimize a Design for Obtaining Quality Data

As discussed in Section 3.3.3 of the SEP, FRL scanning consists of two separate activities. Refer to Section 1.0 of this DQO for a general overview of FRL Phase I and FRL Phase II activities.

Real-time measurements are generated by two methods: 1) the mobile sodium iodide (NaI) detection systems which provide semi-quantitative radiological data, and 2) the stationary high purity germanium (HPGe) system that provides quantitative measurements of radiological COCs. If necessary, physical samples may also be collected for HPGe data verification, and to precertify for non-gamma resolvable ASCOCs.

Surface moisture readings are obtained in conjunction with Phase I and Phase II the NaI and HPGe system measurements using the Troxler nuclear moisture and density gauge or the Zeltex moisture meter. If conditions do not permit the use of the moisture meters, a soil moisture sample may be collected and submitted to the on-site laboratory for percent moisture analysis, or a default moisture value of 20% may be used. The soil moisture data will be used as is discussed in Sections 3.8, 4.11 and 5.2 of the Real-Time User's Manual. The gamma data will be corrected to a dry weight equivalent.

Background radon monitoring will also occur in conjunction with Phase I and Phase II NaI and HPGe system measurements, as specified in the PSP. Refer to the Section 5.3 of the Real-Time User's Manual for a discussion on radium-226 corrections.

Sodium Iodide (NaI) System

The mobile NaI detector systems are collectively called the Radiation Measurement Systems (RMS). They are used to achieve as close to complete coverage of the area as possible, taking into consideration the topographic and vegetative constraints which limit access. The NaI systems currently are used to obtain measurements over an area specified in a PSP to detect radiological total activity patterns and elevated radiological activity. The NaI detector systems are used at a 31 cm detector height at 1 mph for a 4 second acquisition with a 0.4 meter overlap, and are consistent with the Real-time User's Manual. If the total uranium FRL is 20 ppm or lower, the NaI systems should not be used for FRL attainment, the HPGe system should be used.

The mobile NaI systems are electronically coupled with a global positioning system (GPS) rover and base unit to record each measurement location. Counting and positioning information is recorded continuously on a field personal computer (PC) and stored on disk or hard drive for future downloading on the site soil database and Graphical Information System (GIS) system, or transferred directly to the Local Area Network (LAN) by Ethernet.

Information from the NaI/GPS system is recorded on the PC and transferred to the Unix system through the local area network on a regular (at least daily) basis. The information is plotted on the FEMP GIS system, or in the field using Surfer software. With the output, patterns of elevated total activity, and locations of elevated concentrations can be identified.

Data reduction is an important aspect of NaI system data use. Individual total uranium, radium-226 and thorium-232 concentrations will undergo two-point averaging. The two-point averaged values will be mapped and evaluated with respect to 3x FRL.

NaI measurements may be used for design, excavation during remediation, and precertification decision making if the measurements clearly indicate below FRL criteria have been met. They may also be used to determine the location and number of FRL Phase II HPGe measurements, if required.

<u>In-Situ HPGe Detectors</u>

The HPGe detector is used during FRL Phase I or FRL Phase II, as follows:

- During FRL Phase I, the HPGe is used in areas where topographic or vegetative constraints prevent mobile NaI detector access or if the NaI systems are out of service. The HPGe is used in a 99.1% coverage grid over the accessible area. Detector height is 1 meter with a count time of 15 minutes.

- During FRL Phase II, the HPGe detector is used at strategic locations established thorough the FRL Phase I screening. These locations are where the highest readings of gross gamma activity were identified and/or where individual ASCOC concentrations were identified as hot spots. The HPGe is used to identify radiological COC levels, which in turn provide information concerning the ability to pass FRLs. The number of Phase II HPGe measurements to delineate the hot spot boundary varies based on the size of extent of contamination. If the area potentially exceeding the 2x FRL or 3x FRL exhibits a visible contamination boundary, the Project may determine that Phase II measurements may not need to be collected.

Physical Soil Sampling

Physical samples may be collected and analyzed for target radiological COCs to verify the HPGe measurements and/or to precertify for non-gamma discernable ASCOCs. If physical samples are required, they will be collected in compliance with the applicable sampling DQO. Criteria for obtaining physical samples, such as sample density, will be specified in the PSP, if necessary. The minimum data quality acceptable for this purpose will be identified in the applicable sampling DQO. Field QC, ASL and Validation requirements will be consistent with the SCQ and SEP requirements.

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Data Quality Objectives
Real Time FRL Measurements

1A. Task/Description: FRL real-time measurements.
1B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☐ RA ☒ R$_v$A ☐ OTHER ☐

1.C. DQO No.: SL-056, Rev. 0 DQO Reference No.: Current Sampling DQO

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2. Media Characterization: (Put an X in the appropriate selection.)

Air ☐ Biological ☐ Groundwater ☐ Sediment ☒ Soil ☒

Waste ☐ Wastewater ☐ Surface water ☐ Other (specify) ______

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3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization
A ☒ B ☒ C ☐ D ☐ E ☐

Risk Assessment
A ☐ B ☐ C ☐ D ☐ E ☐

Evaluation of Alternatives
A ☐ B ☐ C ☐ D ☐ E ☐

Engineering Design
A ☒ B ☒ C ☐ D ☐ E ☐

Monitoring during remediation activities
A ☒ B ☒ C ☐ D ☐ E ☐

Other: Precertfication
A ☒ B ☒ C ☐ D ☐ E ☐

4.A. Drivers: Applicable or Relevant and Appropriate Requirements (ARARs), Operable Unit 5 Record of Decision (ROD), the Real-Time User's Manual, the Sitewide Excavation Plan and the Project-Specific Plan (PSP).

4.B. Objective: To determine if the area of interest is likely to pass FRLs for all HPGe discernable radiological COCs

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5. Site Information (Description): The OU2 and OU5 RODs have identified areas at the FEMP that require remediation activities. The RODs specify that the soils in these areas will be clean and demonstrated to be below the FRLs.

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1. pH	☐	2. Uranium	☒*	3. BTX	☐
Temperature	☐	Full Rad.	☒*	TPH	☐
Spec.Conductance	☐	Metals	☐	Oil/Grease	☐
Dissolved Oxygen	☐	Cyanide	☐		
Technetium-99	☐	Silica	☐		
4. Cations	☐	5. VOA	☐	6. Other (specify)	
Anions	☐	ABN	☐	Percent Moisture	
TOC	☐	Pesticides	☐		
TCLP	☐	PCB	☐		
CEC	☐				
COD	☐				

* If specified in the PSP for NaI and HPGe detectable rad's.

6.B. Equipment Selection and SCQ Reference:

Equipment Selection	Refer to SCQ Section
ASL A Mobile NaI, HPGe and HPGe*	SCQ Section: Not Applicable
ASL B HPGe*	SCQ Section: App. G , Table 1
ASL C ______	SCQ Section: ______
ASL D ______	SCQ Section: ______
ASL E ______	SCQ Section: ______

* Choosing the ASL level for Phase II FRL HPGe measurements is at the discretion of the project considering the project need for validated data.

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased [X] Composite [ ] Environmental [ ] Grab [X] Grid [X]

Intrusive [ ] Non-Intrusive [X] Phased [ ] Source [ ]

7.B. Sample Work Plan Reference: The DQO is being established prior to completion of the Project-Specific Plans.
Background samples: OU5 RI/FS

7.C. Sample Collection Reference:
-EQT-22, *Characterization of Gamma Sensitive Detectors*
-EQT-23, *Operation of High Purity Germanium Detectors*
-EQT-32, *Troxler 3440 Series Surface Moisture Gauge*
-EQT-33, *Real Time Differential Global Positioning System*
-EQT-39, *Zeltex Infrared Moisture Meter*
-EQT-40, *Satloc Real-time Differential Global Positioning System*
-EQT-41, *Radiation Measurement Systems*
-ADM-16, *In-Situ Gamma Spectrometry Quality Control*
-User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site, 20701-RP-0006

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8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	[ ]	Container Blanks	[ ]
Field Blanks	[ ]	Duplicate Samples	[X]*
Equipment Rinsate Samples	[ ]	Split Samples	[ ]
Preservative Blanks	[ ]	PE Samples	[ ]

Other (specify) Radon Monitoring, moisture *
* If specified in the PSP.

8.B. Laboratory Quality Control Samples:

Method Blank	[ ]	Matrix Duplicate/Replicate	[ ]
Matrix Spike	[ ]	Surrogate Spikes	[ ]

Other (specify) ____________________

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9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

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APPENDIX B

TARGET ANALYTE LISTS

APPENDIX B
TARGET ANALYTE LISTS

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TAL 20450-PSP-0001-A
(ASL B)

Analyte	Method	FRL limit	MDC
Total Uranium	ICP/MS or Alpha or Gamma Spectroscopy	82 ppm	8 ppm
Thorium-228	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Thorium-232	Alpha or Gamma Spectroscopy	1.5 pCi/g	0.15 pCi/g
Radium-226	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Radium-228	Alpha or Gamma Spectroscopy	1.8 pCi/g	0.18 pCi/g

TAL 20450-PSP-0001-B
(ASL B)

Analyte	Method	FRL limit	MDC
Total Uranium	ICP/MS or Alpha or Gamma Spectroscopy	82 ppm	8 ppm
Thorium-228	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Thorium-232	Alpha or Gamma Spectroscopy	1.5 pCi/g	0.15 pCi/g
Radium-226	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Radium-228	Alpha or Gamma Spectroscopy	1.8 pCi/g	0.18 pCi/g
Total Arsenic	ICP/MS or AES	12 ppm	1.2 ppm

TAL 20450-PSP-0001-C
(ASL B)

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Analyte	**Method**	**FRL limit**	**MDC**
Total Uranium	ICP/MS or Alpha or Gamma Spectroscopy	82 ppm	8 ppm
Thorium-228	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Thorium-232	Alpha or Gamma Spectroscopy	1.5 pCi/g	0.15 pCi/g
Radium-226	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Radium-228	Alpha or Gamma Spectroscopy	1.8 pCi/g	0.18 pCi/g
Total Beryllium	ICP/MS or AES	1.5 ppm	0.15 ppm

MDC - minimum detection concentration